CONSEIL PERMANENT INTERNATIONAL POUR
L'EXPLORATION DE LA MER

# RAPPORTS

ET

# PROCES-VERBAUX DES RÉUNIONS

VOLUME XXXII

## PROCÈS-VERBAUX

(OCTOBRE — 1923)

EN COMMISSION CHEZ
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# SEIZIÈME RÉUNION
## PARIS — OCTOBRE 1923.

### BUREAU DU CONSEIL:

M. H. G. Maurice, Président du Conseil.
M. Otto Pettersson, Vice-Président du Conseil.
*M. J. Hjort, Vice-Président du Conseil.
M. T. Tissier, Vice-Président du Conseil.
M. F. Drechsel, Membre et Secrétaire-Général du Conseil.

### MEMBRES DU CONSEIL ET EXPERTS
et leurs adresses:

**Belgique:** M. G. Gilson, Professeur, Directeur du Musée Royal d'histoire naturelle de Belgique, *Bruxelles.*
M. A. Hamman, Président du Comité de Mariculture, Membre du Parlement Belge, Rue longue 60, *Ostende.*

**Danemark:** M. le Commandeur C. F. Drechsel, *Copenhague,* Strandvej 34.
M. Martin Knudsen, Professeur à l'Université, Polyteknisk Læreanstalt, *Copenhague.*
Experts: M. le Dr. A. C. Johansen, Strandvej 34, *Copenhague.*
M. le Dr. C. H. Ostenfeld, Professeur à l'Université et Directeur du Jardin Botanique, Gothersgade 140, *Copenhague.*
M. le Dr. Johs. Schmidt, Directeur du Laboratoire Carlsberg, Section de Physiologie, *Valby, Copenhague.*

**Finlande:** M. le Dr. R. Witting, Professeur, Directeur de l'institut finlandais pour l'exploration de la Mer (ou Directeur de "Merentutkimuslaitos"), *Helsingfors.*
*M. le Dr. T. H. Järvi, Directeur des Pêches (ou Directeur de "Kalastushallitus"), *Helsingfors.*

* N'a pas assisté à la réunion de Paris.

**France:** M. Théodore Tissier, Président de section au Conseil d'État, Président du Conseil d'Administration de l'Office scientifique et technique des Pêches maritimes, 13, rue Monsieur, *Paris.*

M. George Lecourbe, Directeur du service des Pêches maritimes et du Personnel central au Sous-Secrétariat d'État de la Marine Marchande, 24, rue du Boccador, *Paris.*

Experts: M. le Professeur L. Joubin, 55, rue de Buffon, *Paris.*

M. le Dr. Ed. le Danois, 3, avenue Octave Gréard, *Paris.*

**Grande Bretagne:** Mr. H. G. Maurice, C. B., Fisheries Secretary, 43, Parliament Street, *London.*

Professor D'Arcy W. Thompson, C. B., F. R. S., The University, *St. Andrews.*

Experts: Mr. J. O. Borley, O. B. E., Fisheries Laboratory, *Lowestoft.*

Mr. A. Bowman, D. Sc., Fishery Board Laboratory, *Aberdeen.*

Mr. Edser, 43, Parliament Street, *London.*

Mr. Graham, Fisheries Laboratory, *Lowestoft.*

Mr. D. T. Jones, C. B. E., Chairman of the Fishery Board for Scotland, *Edinburgh.*

Dr. E. S. Russell, Director of Fishery Investigations, Fisheries Laboratory, *Lowestoft.*

**État Libre d'Irlande** (Invités): Mr. G. P. Farran, Inspector of Fisheries, Irish Free State, 3, Kildare Place, *Dublin.*

Mr. R. Southern, Inspector of Fisheries, Irish Free State, 3, Kildare Place, *Dublin.*

**Lettonie:** Mr. W. Miezis, Ministère d'Agriculture, *Riga.*

**Norvège:** *M. le Professeur Johan Hjort, à l'Université, *Christiania.*

*M. Einar Lea, Fiskerikonsulent, *Bergen.*

**M. Rolf Andvord, Secrétaire à la Légation Norvégienne, *Paris.*

**Pays-Bas:** M. le Dr. E. van Everdingen, Professeur à l'Université, Directeur en Chef de l'Institut Météorologique Royal des Pays-Bas, *De Bilt.*

M. le Dr. H. C. Redeke, Directeur du "Rijksinstituut voor Biologisch Visscherijonderzoek", *Helder.*

* N'a pas assisté à la réunion de Paris.

** A remplacé les délégués norvégiens à la réunion de Paris.

**Portugal:** *M. le Colonel F. A. Chaves, Directeur du Service Météorologique des Açores, Ponta Delgada, *Açores.*
M. l'Amiral A. E. Neuparth, Intendance de la Marine, *Lisbonne.*

**Suède:** M. le Dr. O. Pettersson, Professeur, Holma, *Lysekil.*
*M. le Dr. Gustaf Ekman, Södra Hamargatan 11, *Göteborg.*
Experts: M. le Dr. K. A. Andersson, Directeur des Pêches maritimes, Kungl. Lantbruksstyrelsen, *Stockholm.*
M. le Dr. H. Pettersson, Docent, *Göteborg.*

* N'a pas assisté à la réunion de Paris.

# AGENDA

## for the Sixteenth Meeting of the International Council for the Exploration of the Sea.

(Paris, 1st—5th October 1923.)

1. Opening of the Proceedings, by the President.
2. Report by the General Secretary as to the present participation.
3. Administrative Report.
4. Final Approval of the Accounts for 1921—22.
5. Statement of Accounts for 1922—23.
6. Estimates for the financial year 1923—24.
7. Formation of Sections and Committees (Hydrographical, Plankton, Statistical, Limnological, and Committees dealing with the Plaice, Herring, Baltic, Atlantic Slope and other Atlantic Investigations).
8. Reports and proposals of the Sections and Committees.
9. Nomination of the Members of the Bureau, of the Editorial Committee and the Finance Committee, of Editors and Conveners.
10. Memorandum by O. Pettersson and C. F. Drechsel about an International Expedition for Sea Research. Proposal for discussion of the Council.
11. Proposal concerning abstracts of oceanographical literature by M. Knudsen — C. H. Ostenfeld — Johs. Schmidt.
12. Other business.
13. Conclusion of the meeting.

# REPORT

of

## the 16th Meeting of the Council.

Plenary Meetings of the Council were held in Paris on October 1st, 3rd and 5th.

The Committees on Plaice, Herring, Atlantic Slope, North Atlantic, Baltic, Plankton, Statistics, Hydrography, Limnology, Cod and Haddock held meetings from the 2nd to the 5th of October.

### First Sitting: Monday, October 1st, 1923, at $3^1/_2$ p. m.

The President, M. MAURICE, in the Chair.
Present: the members, experts, etc., (vide list p. 5 to 7).

M. DISLÈRE, président de Section honoraire au Conseil d'Etat et président du Conseil d'Administration de l'Institut Océanographique, prend la parole pour offrir — en exécution de l'invitation faite il y a deux ans par le regretté Prince de Monaco — l'hospitalité aux membres du Conseil International dans le palais scientifique consacré à l'étude de la Mer par S. A. S. ALBERT Ier. M. DISLÈRE présent les vœux que forme le Conseil d'Administration de l'Institut Océanographique pour l'heureux résultat des travaux du Congrès.

Under **Point 1** of the Agenda, 1st October, the President formally opened the proceedings in the following words:

Messieurs, je crois que je suis l'interprête de tous les membres du Conseil en remerciant d'abord M. DISLÈRE, Président du Conseil d'Administration de l'Institut Océanographique du bon accueil qu'il nous a réservé dans cette superbe fondation du regretté Prince ALBERT Ier de Monaco, dont le souvenir comme un des premiers maîtres de l'Océanographie restera toujours gravé dans le mémoire des savants de tous les pays.

Ensuite vous voudrez bien vous joindre à moi pour exprimer au Gouvernement de la République Française la vive satisfaction que nous éprouvons à nous réunir à Paris. Nous nous rappelons que nous devons en particulier cette heureuse invitation à notre collègue et Vice-Président, mon ami, M. Théodore Tissier, que je prie en votre nom de bien vouloir recevoir l'expression de notre parfaite gratitude au nom du Gouvernement qu'il représente ici.

Depuis la dernière séance du Conseil nous avons à déplorer la mort de quelques-uns de nos anciens collègues: M. le professeur Homén, qui au début du Conseil fut le représentant de la Finlande pendant de longues années. M. Nelson, dont la mort tragique nous serre à tous le cœur et M. Gehrke, dont nous regrettons les services qu'il a si longtemps et si brillamment rendu à notre Conseil. Je suis certain que vous voudrez tous exprimer aux parents de M. Nelson et à la veuve de M. Gehrke tous nos regrets et toute notre sympathie.

Nous avons à souhaiter la bienvenue à quelques nouveaux participants à nos délibérations, M. l'Amiral Neuparth, nous vous souhaitons la bienvenue comme délégué du Portugal. Dans l'absence des délégués Norvégiens la Norvège est représentée ici par M. Andvord, le représentant de la Légation Norvégienne à Paris, que je salue ici. De même j'ai le plaisir de souhaiter la bienvenue au délégué de la Lettonie et à quelques nouveaux experts qui siègent ici pour la première fois.

Selon notre coutume je vous propose de nous réunir pour adresser par télégramme nos hommages à M. Alexandre Millerand, Président de la République Française, à M. Poincaré, Président du Conseil des Ministres et à Sa Majésté le Roi de Danemark.

**Point 2** of the Agenda, 1st October (Report as to the present participation).

The General Secretary said: With regard to participation, the same countries as last year are at present participating. The resolution of the Council at its last meeting to the effect that Finland for the present — until the finances of the country are in a better state — should pay an annual contribution of 5000 Kr., that in the case of Portugal the contribution of 10,000 Kroner, paid for 1922, should be accepted as a contribution for two years, and that the sum of 5000 Kr. should be accepted in succeeding years unless and until the finances in Portugal are in a better condition, and that Esthonia, Lettonia and Poland, which had applied for admission to the Council but had not made any applications on account of financial difficulties, should for the present be offered free membership — though at liberty to contribute something if they wished according to their means — on the understanding that they would vote only on questions directly affecting their own countries, was communicated by the Danish Foreign Office to the Governments of the participating countries. The Governments — Belgian, British, Finnish, Danish, Dutch, French, Norwegian, Portuguese and Swedish — have agreed to

the proposal, Belgium however, with the reservation that the annual contribution of Belgium should also be reduced to 5000 Kr.

The participating countries have agreed to the proposals of the Council as to the conditions of admission of Esthonia, Lettonia and Poland. — This has been brought to the knowledge of the Governments of these countries.

A delegate from Lettonia, M. Miezis, called with the Lettonian Minister and presented a letter of appointment from the Lettonian Government. It was explained to them that a formal application for admission was necessary, which should be sent to the Danish Foreign Office. In order, however, that M. Miezis might attend the Council meetings, as a delegate, the Bureau took the responsibility of receiving him as the delegate of his country on the understanding that the Minister would arrange for the immediate fulfilment of the necessary formalities. This was done during the meeting.

The condition of Germany is such that no application for re-admission can be expected for the present.

As to the Plaice Question the General Secretary stated: The Danish Foreign Office had communicated the resolution of the Council to the participating countries and at the request of the Bureau had suggested that should the countries concerned find themselves in general accord with the proposals of the Council, the question of the administrative measures which it may be desirable and practicable to take should be considered at a conference of suitable representatives of the countries interested. The Bureau further, through the same channel, offered to do anything within its power to facilitate the deliberations of such a conference.

Later at a Bureau meeting in Stockholm, at the end of June this year, it was resolved to recommend that the above named conference be held next year in Copenhagen at the same time as the Council meeting and to ask the Governments concerned whether they would send delegates to such conference.

In reply hereto answers have been received from the Belgian, Danish, French, and Swedish Governments. The words of the answers differ somewhat, but they are all to the effect that these Governments "seront disposés à prendre part à une conférence chargée d'examiner cette question (de plie) et de rédiger (le cas échéant) une convention internationale". From Great Britain and Norway no answers have as yet been received, and Holland has answered "que le Gouvernement Néerlandais ne juge pas encore le moment venu de conclure une telle convention et sera disposé — en attendant les résultats d'un examen éventuel de la sympathie de l'industrie de la pêche — à préférer pour la protection de la pêche de la plie la fixation d'une mesure minimum ou de deux mesures minimum pour la plie. Toutefois, le Gouvernement Néerlandais est d'avis qu'aussi en ce qui concerne cette mesure le concours de tous les Etats intéressés serait également indispensable, donc outre celui des Pays-Bas, aussi celui du Danemark, de l'Allemagne, de la Belgique, de la France, de la Grande-Bretagne et de la Norvège". In a later letter from the

Danish Foreign Office has been stated: "Vu que la note précitée ne précise pas, si le Gouvernement Néerlandais a en général l'intention de nommer des délégués pour la conférence projétée en 1924, la Légation s'étant informé sous main auprès du Ministère des Affaires Etrangères des Pays Bas à ce sujet, a été renseignée que le Gouvernement Néerlandais était tout disposé à se faire représenter à une telle conférence et que dans sa note le Gouvernement Néerlandais n'a voulu qu'émettre ses doutes quant à l'opportunité de conclure en ce moment une convention, visant à la fermeture de certaines parages."

The President asked whether M. GILSON wished to say anything about the reduction of the Belgian contribution. He then said, that he was instructed to ask for the reduction but only as a temporary measure while the Belgian rate of exchange demanded it.

The President asked whether M. REDEKE wished to say anything as to the Dutch position with regard to the plaice question. Dr. REDEKE said that he for the present had not got the final answer of his Government on that question. What the General Secretary read about the answer of the Dutch Government was partly new to him, and he should like to see that answer before he discussed the matter.

**Point 3** of the Agenda, 1st October (Administrative Report).

The General Secretary gave a short résumé of the administrative report.

**Point 4** of the Agenda, 1st October (Final approval of the accounts for 1921—22).

The General Secretary, in submitting these accounts for the Council's final approval, stated that they had been audited and found correct by the Finance Committee, viz. the President and Messieurs TISSIER, GILSON, EKMAN and JÄRVI. The accounts were approved.

**Point 5** of the Agenda, 1st October (Statement of accounts for the Financial Year 1922—23).

The General Secretary referred to the printed statement of accounts for the financial year 1922—23, distributed to the members. The items of the expenditures were on the whole in accordance with the estimates, with the exception of the item for printing, which showed a considerable saving. This was due to the fact that only one Bulletin came to be printed and that few papers were published as "Publications de Circonstance".

**Point 6** of the Agenda, 1st October (Estimates for the Financial Year 1923—24) was postponed to a later meeting.

**Point 7** of the Agenda, 1st October (Formation of Sections and Committees).

The President suggested on behalf of the Bureau, that the following sections and committees should be formed, and that the first sitting of each committee should be opened by the following gentlemen:

| | |
|---|---|
| Herring Committee | Mr. David Jones. |
| Plankton Section | Professor Ostenfeld. |
| Hydrographical Section | Professor Pettersson. |
| Limnological Committee | Mr. Farran. |
| Statistical Section | Professor D'Arcy Thompson. |
| Atlantic Slope Committee | Professor Joubin. |
| Cod and Haddock Committee | Dr. Russell. |
| Plaice Committee | Dr. Redeke. |
| Baltic Committee | Professor Witting. |

Commander Drechsel, on behalf of the Danish Commission, submitted to the Council a proposal to establish a North Western Atlantic Committee for investigations in an area comprising the waters from Rockall to the North West round Iceland and the Faroe Isles. He explained the proposal of the Commission which had been printed and circulated to the Council and invited Dr. Schmidt to give a more detailed explanation of the proposal.

Dr. Schmidt explained the proposal and said that the Danish Commission had come to the conclusion that the investigations in the area in question could most effectively be prosecuted by a special Committee. This Committee ought to consist of representatives of those countries which are most interested in the area and which find themselves able to contribute to the elucidation of the problems of importance to the fisheries of this area.

On the proposal of Professor Pettersson it was decided to enter this question to a special Committee meeting which should report to the Council at its next sitting. Professor Pettersson said that he was not clear as to the limits of this Committee, for instance as to whether its operations were to be restricted to the Faroes and Iceland or should extend to Norwegian waters. Dr. Schmidt expressed the opinion that later on the work of this Committee might perhaps be extended to Norwegian waters but that it would be better, for the present, to restrict the investigations to the North Western Fishing Grounds.

It was agreed that the discussion of the question should be referred to a special Committee and Dr. Schmidt was asked to arrange for the meeting of the Committee.

The Norwegian delegate, Mr. Andvord, asked that in view of the absence of Professor Hjort the decision of the question might be postponed.

Dr. Redeke expressed the wish that the Council should discuss the question of injury caused to fisheries by oil, especially oil from tank ships. The President suggested that the Atlantic Slope Committee should discuss the question. This was agreed to.

**Point 8 of the Agenda, 1st October (Report and proposal of the Sections and Committees).**

The President asked the chairmen of the various Committees to submit the reports of the meetings of the Committees to the Bureau as soon as possible after the conclusion of their meetings, in order to have the resolutions considered by the Bureau and multiplied for distribution.

**Point 10** of the Agenda, 1st October (Memorandum by Professor O. Pettersson and Commander C. F. Drechsel about an International expedition for Sea Research), was adjourned for discussion at a special meeting to be held later.

**Point 11** of the Agenda, 1st October (Proposal concerning abstracts of oceanographical literature by Professor Knudsen, Professor Ostenfeld and Dr. Johs. Schmidt). The three gentlemen were invited to discuss their proposal to publish abstracts of oceanographical literature with the Bureau with a view to bring it before the Council at a later meeting.

The meeting was then adjourned.

## Second Sitting: Wednesday, October 3rd, 1923, at 12 o'clock.

The President, Mr. Maurice, in the Chair.
Present: the members, experts, etc. (vide list p. 5 to 7).

The President opened the Meeting by saying that the proposal of the Danish Commission (Item **11** of the Agenda) had been considered at a special Committee of the Council and that the following resolution had been proposed:

"That a Committee be formed called "The North Atlantic Committee" for research North of the Latitude of Rockall.

That this Committee commence work in the area suggested in the Memorandum of the Danish Commission, but that it keep in mind the importance of extending its area of observation particularly to the eastern and northern part of the Norwegian Sea.

That this Committee be instructed to arrange its programme in consultation with other Committees concerned, and that Dr. Schmidt be appointed Convener of this Committee".

(en français) "Le Conseil décide qu'un Comité sera formé sous le nom de "Comité de l'Atlantique septentrional"; Son secteur de recherches comprendra la région située au nord de la latitude de Rockall.

Ce Comité fera des observations dans le secteur proposé par la Commission Danoise, il devra envisager une extension possible de ce secteur, particulièrement dans les régions est et nord de la mer de Norvège.

Ce Comité se mettra d'accord pour établir son programme avec les autres Comités intéressés, et le Dr. Schmidt sera nommé président de ce Comité".

This was agreed to, and the following special members of this Committee were selected:

| | | |
|---|---|---|
| Dr. Ed. le Danois | Member for | France. |
| Dr. Russell | — | England. |
| Dr. Bowman | — | Scotland. |
| Mr. Andvord, the Norwegian delegate | — | Norway. |

The programme for the following days was then prepared.

## Third Sitting: Friday, October 5th, 1923, at $3^1/_2$ p. m.

The President, Mr. Maurice, in the Chair.
Present: the members, experts, etc. (vide list p. 5 to 7).

The President briefly introduced M. Rio, Sous-Secrétaire d'Etat des Ports, de la Marine Marchande et des Pêches, who was present to greet the Council. Addressing M. Rio the President said:

"Nous vous remercions de l'honneur que vous nous faites en venant assister à notre séance de cloîture. Vous pouvez nous parler non seulement en qualité de Ministre Français mais aussi en qualité de Ministre de la Marine. Un représentant de la République et un bon marin sont toujours la bienvenue dans notre Conseil. La combinaison que nous trouvons dans votre personne de ces deux qualités vous assure une double bienvenue. J'ai eu l'occasion de remarquer, quand j'ai eu le grand plaisir de vous recevoir sur le "George Bligh" à Boulogne, non seulement que vous aviez bien à cœur tout ce qui peut être intéressant pour l'industrie de la pêche, mais aussi que vous en parliez en maître.

Je vous prie de bien vouloir être notre interprète auprès du Gouvernement de la République et de le remercier encore une fois pour l'accueil si aimable qui nous est fait à Paris."

M. Rio répond en disant qu'il est heureux de se trouver de nouveau dans la maison du Prince Albert. Il avait pris part, cette année, à un Congrès de la Commission Internationale pour l'Exploration Scientifique de la Mer Méditerranée et il considère comme un honneur pour la France d'avoir reçu pendant la même année, deux organisations de si haute distinction. M. Maurice a eu parfaitement raison en disant qu'il s'intéresse beaucoup à l'industrie de la pêche et à l'exploration de la mer. Bien qu'il ne soit pas un savant et que son travail journalier l'ait placé bien à l'écart de la science, il suit avec le plus vif intérêt les travaux de ces organisations et il est plein d'admiration devant les travaux qu'elles ont accomplis. Sa gratitude était d'autant plus grande que ces travaux

ont contribué à un haut degré au rapprochement de la science et de la vie pratique et du fait, aussi, que l'on s'est intéressé, non seulement aux questions qui nécessitent des explorations dans les mers lointaines, comme l'ont demandé les recherches danoises sur la biologie de l'anguille, mais que l'on se préoccupe aussi des recherches à faire dans les eaux côtières au profit de l'industrie de la pêche.

Par malheur, dit-il, les destructions de la guerre se ressentent encore au point que le fonctionnement intense de la pêche et des industries accessoires de la pêche n'est pas encore devenu possible mais il a la conviction que les savants, réunis à l'Institut du Prince Albert, obtiendront les meilleurs résultats par leur collaboration; il exprime le vœu sincère qu'il en soit ainsi pour le plus grand bien de notre temps et pour l'honneur du Conseil International pour l'Exploration de la Mer.

In accordance with the decision of the Council at its first sitting the following telegrams have been sent:

Monsieur le Président de la République Française, Paris.

Les Membres du Conseil International pour l'exploration de la Mer réunis à Paris demandent la permission de Vous exprimer toute leur satisfaction de se trouver en France. Ils Vous remercient de Votre gracieuse invitation et Vous présentent leurs hommages les plus respectueux.

Maurice, Président, Paris.

Monsieur le Président du Conseil des Ministres,
Ministère des Affaires Etrangères, Paris.

Les Membres du Conseil International pour l'exploration de la Mer réunis à Paris tiennent à saluer le chef du Gouvernement Français et à le remercier de l'hospitalité donnée par la France au Conseil.

Maurice, Président, Paris.

Sa Majésté le Roi de Danemark, Copenhague.

Les Membres du Conseil International pour l'exploration de la Mer réunis à Paris demandent la permission de rendre à Votre Majésté leurs hommages les plus respectueux.

Maurice, Président, Paris.

In reply hereto the following telegrams have been received:

Urgent affaires étrangères à Mr. Maurice, Président du Conseil International pour l'exploration de la Mer, 195, Rue St. Jacques, Paris.

Je vous prie de remercier les membres du Conseil International des sentiments que vous avez bien voulu m'exprimer en leur nom. La France et son Gouvernement ont été heureux d'accueillir les personnalités éminentes qui vous entourent et dont les travaux présentent un caractère si évident d'intérêt scientifique et d'utilité pratique.

Poincaré.

Monsieur Maurice, Conseil International l'exploration de la Mer, Paris.

Mes remerciements sincères.

Christian R.

Le Directeur du Cabinet du Président de la République sent the following letter to M. TISSIER:

"Monsieur le Ministre,

M. MAURICE a fait parvenir un télégramme de sympathie au Président de la République au nom des Membres du Conseil International pour l'exploration de la Mer, réunis en Congrès à Paris.

Le Président de la République a été très touché des sentiments qui lui ont été exprimés et il vous serait reconnaissant de vouloir bien être auprès de M. MAURICE et des Membres du Conseil International pour l'exploration de la Mer l'interprète de ses vifs remerciements.

Veuillez agréer, Monsieur le Ministre, l'assurance de ma haute considération."

BOMPARD.

**Point 2** of the Agenda, 5th October (Report by the General Secretary as to the present participation).

The President on behalf of the Bureau proposed that the participating Governments should be advised through the ordinary channels to agree to the reduction of the Belgian contribution to Kr. 5000 as a temporary measure, in view of the existing state of the Belgian finances. This was agreed to.

**Point 6** of the Agenda, 5th October (Estimates for the financial year 1923—24).

The President called upon the General Secretary to lay the estimates before the Council. The General Secretary referred to the draft estimates laid before the members. He said that the receipts would now be reduced by 5000 Kroner on account of the request for the reduction of the Belgian contribution. The total of the receipts would consequently be reduced from 105,000 Kroner, as drafted, to 100,000 Kroner.

Expenditures. The items of the draft estimates were now submitted by the Bureau for the approval of the Council.

As to the extraordinary expenses the General Secretary referred to the remarks of the draft estimate that these could not be estimated until a Bureau Meeting had been held. The Bureau had now approved the expenses as follows: To Mrs. GEHRKE, Dr. GEHRKE's ordinary salary should be paid till the end of December this year. After this time until the end of the financial year 1924, Kr. 83.33, that is to say $^1/_{12}$ of 1000 Kroner yearly should be paid to her monthly, total 555.55 Kroner.

Further it was resolved that an honorarium should be paid to Miss HOUGENS for her good service. After some discussion this honorarium was fixed at 2000 Kroner.

For the decoration of the Bureau at "Eltham" 3000 Kroner was agreed to.

For binding of books 600 Kroner. Total of extraordinary expenses 6155.55 Kroner.

The Estimates were agreed to by the Council as included on page 21.

**Point 8** of the Agenda, 5th October (Reports and proposals of the Sections and Committees).

The President laid the reports and resolutions of the Committees before the Council.

All programmes were agreed to and the following remarks were made:

Plaice Committee. The President said that provisions would be made for having Mr. BORLEY's report printed in England.

The President called upon Dr. REDEKE asking him to express his views on his Government's attitude to the Plaice Conference in Copenhagen next year, and other plaice questions mentioned in the sitting Monday last. Dr. REDEKE said: I wish to propose that the English delegates be asked to procure the material to form a basis for a first estimate of the cost of the policing of the areas and to make a scheme of the way in which it could be performed. Secondly I wish to call the attention to the passage in the reply of the Dutch Government, where the views are expressed that all the countries concerned should be represented at the Plaice Conference.

In replying the President said with regard to the first point that the British representatives would endeavour to procure such material, and with regard to the second point that it was obvious that at some stage all countries concerned must be brought into the discussion of the Plaice question, but that the question of how and when that should be done was a matter for the interested Governments and not for the Council.

**Point 9** of the Agenda, 5th October (Nomination of Members).

According to suggestion of the President the following elections were made and agreed upon:

As Editors: D'ARCY W. THOMPSON for Statistics, Professor MARTIN KNUDSEN for Hydrography, Professor OSTENFELD for Plankton.

Editorial Committee: Professor PETTERSSON, chairman, Professor G. GILSON, Professor WITTING.

Finance Committee: The President, Professor KNUDSEN, Directeur LE COURBE, Professor VAN EVERDINGEN, Monsieur HAMMAN.

Dr. REDEKE: I think to express the feelings of the Council by proposing the reelection of the Members of the Bureau. Applause.

**Point 10** of the Agenda, 5th October (International Expedition).

The following recommendation was suggested and adopted by the Council:

"The Council, having studied the proposal of Professor PETTERSSON and Commander DRECHSEL that a great international investigation of the Oceans of the world should be undertaken, records its opinion that an increased knowledge of the Ocean systems is not merely of scientific interest but also of practical im-

portance for the explanation and the forecasting of phenomena affecting life both in the sea and on land.

The Council is of opinion that such an investigation must necessarily extend over many years and that it could best be initiated by a preliminary reconnaissance, such as has been suggested by the authors of the proposal by means of a suitable vessel such as the yacht of the late Prince of Monaco.

The Council appreciates the fact that the authors of the proposal have not invited the Council to undertake or to contribute to the expenses of the investigations, which go far beyond the limits both of the resources and of the mandate of the Council, but merely to give to their proposal the support of its recommendation. The Council gladly recommends the proposal to the favourable consideration of the Governments and the scientific institutions of all countries. The Council makes this recommendation the more readily because it believes that the investigation may produce results of importance to fishery investigations.

The Council is of opinion that the annual cost of the preliminary expedition, over and about the cost of the acquisition of a suitable ship which in present circumstances could be acquired at a moderate price, need not be more than approximately 30.000 Pounds Sterling to 35.000 Pounds Sterling per annum, that is to say 120,000 to 140,000 Pounds Sterling for the four years.

Should the proposal meet adequate support the Council would be prepared to undertake the general direction of the work."

(en français) "Le Conseil, après examen de la proposition faite par le Professeur Pettersson et le Commandeur Drechsel, d'entreprendre une grande étude internationale des océans du monde entier, affirme son opinion que le développement de nos connaissances sur le système océanique est, non seulement, d'un grand intérêt scientifique, mais aussi d'une importance pratique pour l'explication des phénomènes qui influent sur la vie sur terre et dans l'eau.

Le Conseil pense qu'une telle étude doit porter nécessairement sur plusieurs années et qu'elle doit débuter par une reconnaissance préliminaire qui pourrait être effectuée, ainsi qu'il a été suggéré par les auteurs de la proposition, au moyen d'un vaisseau approprié, tel que le yacht du regretté Prince de Monaco.

Le Conseil insiste sur le fait que les auteurs de la proposition ne lui ont pas demandé d'entreprendre lui-même l'étude, ni de contribuer aux dépenses qu'elle entraîne, ce qui dépasserait de beaucoup son rôle et ses ressources, mais simplement de donner à leur proposition l'appui de sa recommandation.

En conséquence, le Conseil recommande avec plaisir cette proposition à l'attention bienveillante des Gouvernements et des Institutions scientifiques de tous les pays.

Le Conseil fait avec empressement cette recommandation parce qu'il croit que cette étude fournira des résultats importants pour les recherches sur les pêcheries.

Le Conseil estime que le coût annuel de l'expédition préliminaire, en dehors du prix d'achat du navire approprié, qui dans les circonstances actuelles peut être acheté à un prix très modéré, ne dépassera pas approximativement £ 30.000 ou £ 35.000 par an, soit £ 120.000 ou 140.000 pour les quatre ans.

Si la proposition rencontre l'aide voulue, le Conseil accepterait d'entreprendre la direction générale des travaux."

**Point 11** of the Agenda, 5th October (Abstracts of literature).

The President said that he very much appreciated the idea of the three authors, but in present times the Bureau could not see its way to afford the sum wanted. If the authors of the proposal would undertake preliminary inquiries by correspondence, the Bureau would, however, be prepared to pay all expenses for correspondence, postage, etc. The question might then be reconsidered next year. This was agreed to by the three authors.

**Point 13** of the Agenda, 5th October (Closing of the meeting).

It was stated that the next Meeting would be in Copenhagen, and the time given later, after the next Bureau meeting.

At the conclusion of the meeting M. le président Tissier proposed to thank the President and the General Secretary which was passed by acclamation.

The President and the General Secretary briefly responsed and expressed their sincere thanks for all hospitality and help from their French Collegues and the staff of the Institut Océanographique.

The meeting then terminated.

# ESTIMATE

of

## the International Council for the Study of the Sea for the financial year 1923—24

### Receipts:

| Head | No. | Items | Kroner | Kroner |
|---|---|---|---|---|
| I | 1 | **Cash balance** on 21st July 1923 | | 123 656 49 |
| II | | **Annual contributions** of the Governments for 1923—24: * | | |
| | 2 | Belgium | 5 000 | |
| | 3 | Great Britain | 25 000 | |
| | 4 | Denmark | 10 000 | |
| | 5 | Finland | 5 000 | |
| | 6 | France | 25 000 | |
| | 7 | Netherlands | 10 000 | |
| | 8 | Norway | 10 000 | |
| | 9 | Sweden | 10 000 | |
| | | Esthonia | | |
| | | Lettonia | | |
| | | Poland | | |
| | | | 100 000 | 100 000 00 |
| | | Total Receipts... | | 223 656 49 |

* Without Portugal, owing to the resolution of the Council approved by the participating Governments to the effect that the 10 000 Kr. paid by Portugal in 1922 should cover two years. They were inserted in the estimates approved by the Council for 1922—23.

### Expenditures:

| Head | No. | Items | Kroner | Kroner |
|---|---|---|---|---|
| I | | **Incidental Expenses:** | | |
| | 1 | President | 3 600 | |
| | 2 | General Secretary | 12 000 | |
| | 3 | Chairman of Editorial Committee | 2 000 | |
| | 4 | Editor for Hydrography | 3 000 | |
| | 5 | Editor for Statistics | 2 000 | |
| | 6 | Editor for Plankton questions | 3 000 | 25 600 |
| II | | **Assistance:** | | |
| | 7 | 1st Assistant Secretary | 5 000 | |
| | 8 | 2nd » » | 4 000 | |
| | 9 | Hydrographical Department | 8 750 | |
| | 10 | Statistical Department | 8 000 | |
| | 11 | Plankton Department | 1 500 | 27 250 |
| III | | **Expenses of the Office in Copenhagen:** | | |
| | 12 | Rent, service, stationery, books, light, gas, telephone, telegrams, postage, freights, typewriting, minor expenses of meetings and other expenses | 14 000 | 14 000 |
| IV | 13 | **Travelling Expenses** of the administrative Staff | 7 000 | 7 000 |
| V | 14 | **Special Resolutions** of the Council (Conveners etc.) | 11 150 | 11 150 |
| VI | 15 | **Printing and distribution** | 20 000 | 20 000 |
| | | | 105 000 | 105 000 |
| VII | 16 | **Extraordinary Expenses** * | 6 155 55 | 6 155 55 |
| | | | | 111 155 55 |

* Mrs. Gehrke after 31st December 1/12 of 1000 Kr. per month = Kr. 555.55. Miss Hougens Kr. 2 000.00. Furniture and moving expenses Kr. 3 000.00. Binding of books Kr. 600.00. Total Kr. 6 155.55.

## Programmes of Committees and Sections adopted by the Council.

### Programme of the Herring Committee.

The Committee resolved to confirm the scheme of herring investigations adopted at their last meeting pending the completion of the arrangements for standardising the method of reading the herring scales.

### Programme of the Plankton Section.

1) It is recommended that the description of the standard net mentioned in the recommendations from 1921 and 1922 be published this year by the Bureau (cf. Rep. 1921 para. 1 and 1922 para. 2).
2) If new instruments have been tried sufficiently and found satisfactory it is recommended that descriptions of them be published by the Bureau.
3) It is recommended that investigations of limited scope, e. g. like those carried out by England in the North Sea (cf. Publication de circonstance No. 78) be continued, as it is at the present time hardly possible to get funds and specialists for larger investigations.
4) The examination and analysis of the food of the herring going on in the different countries is still one of the most important tasks of the plankton workers, and it is recommended that these researches be continued as extensively as possible.

With these modifications the recommendations passed in 1921 and 1922 are repeated.

### Programme of the Hydrographical Section.

1) The programme outlined in 1922 (Rapports et Procès-Verbaux des Réunions, Vol. XXVIII, Procès-Verbaux September 1922, pag. 26—31) is to be continued.

## Programmes des Comités & Sections ratifiés par le Conseil.

### Programme du Comité du Hareng.

Le comité confirme le plan de recherches sur le hareng adopté à sa dernière réunion, sous réserves de compléter la standardisation méthodique de la lecture des écailles.

### Programme de la Section du Plankton.

1) Il est désirable que la description du filet Standard précisée par les résolutions de 1921 et 1922, soit publiée cette année par le bureau (Cf. Rep. 1921, par. 1, et 1922, par. 2).
2) Si de nouveaux instruments, après des essais suffisants ont été trouvés satisfaisants, il est désirable que leur description soit publiée par le bureau.
3) Il est désirable que des recherches à buts limités, comme celles, par exemple, entreprises par l'Angleterre en Mer du Nord (Cf. Publication de circonstance no. 78) soient continuées, car il est difficile actuellement de trouver des fonds et des spécialistes pour des recherches plus étendues.
4) L'examen et l'analyse de la nourriture du hareng entrepris par les différents pays est toujours une des plus importantes tâches des spécialistes du plankton, et il est désirable que ces recherches soient continuées avec tout le développement possible.

Avec ces modifications, les résolutions adoptées de 1921 et 1922 sont confirmées.

### Programme de la Section Hydrographique.

1) Le Programme établi en 1922 (Rapports et Procès-Verbaux des Réunions, Vol. XXVIII, Procès-Verbaux Septembre 1922, p. 26—31) sera continué.

2) It is recommended that the methods for measuring the currents of the sea continuously by means of recording current metres suspended from submarine buoys, which have been developed by Swedish hydrographers, as well as other suitable methods should be applied to the study of the tidal currents at selected points in the North Sea.
3) It is recommended to issue a Bulletin Hydrographique covering the calendar years 1920, 1921, 1922 and 1923.

The Bulletin should only contain material which has not been printed elsewhere. Part A. should contain surface-observations of temperature and salinity, Part B. observations of temperature and salinity from serial measurements, and Part C. should contain Oxygen and other observations from serial measurements. The Bulletin is also to contain monthly means of temperatures (and salinities) from lightships as well as sea levels from chosen stations.

In the Bulletin is to be given a complete list of publications issued in participating countries, which contains hydrographical observations made during the current years.

4) With regard to current-measurements it is recommended, that the material should not be printed in full, but that a summary report should be prepared at the cost of the Council.

## Programme of the Limnological Section.

**Denmark:**

1) Growth and habits of seatrout in fresh water and in the sea.
2) Investigations as to the H-ion concentration in certain fresh waters in connection with a study of distribution of certain fishes and invertebrates.

**France:** Continuation des recherches sur la croissance et la migration des Alosa et Acipenser ainsi que sur la croissance et la migration des jeunes saumons.

**Finland:** Continuation of the researches of salmon and coregonus albula in the Baltic and the fresh waters.

**Holland:** Further investigations as to the growth of young salmon and seatrout in fresh water. Plankton and bottom-fauna investigations in brackish waters.

**Ireland:** Growth and habits of salmon and seatrout, especially in fresh water.

2) Il est désirable que les méthodes en usage pour la mesure des courants marins à l'aide d'appareils spéciaux suspendus à des bouées sous-marines, appareils qui ont été améliorés par les hydrographes suédois, ainsi que d'autres méthodes efficaces, soient appliquées à l'étude des courants de marée dans certains endroits choisis de la Mer du Nord.
3) Il est désirable de publier un bulletin hydrographique pour les années 1920, 1921, 1922 et 1923.

Ce bulletin ne contiendra que les documents qui n'ont pas été déjà publiés: la partie A, comprendra les observations sur les températures et salinités de surface; la partie B, les observations de températures et salinités sur des prises faites en série à différentes profondeurs; la partie C, des observations sur la contenance en oxygène des eaux et d'autres observations établies d'après des mesures en série. Ce bulletin devra aussi comprendre des mesures de températures et de salinités établies par moyennes mensuelles à différentes stations et en particulier sur les bateaux-phares.

Dans ce bulletin sera donné une liste complète des publications fournies par les nations adhérentes qui contiennent des renseignements hydrographiques pendant les mêmes années.
4) En ce qui concerne la mesure de courants, il est désirable que toutes les données ne soient pas intégralement publiées mais que seulement un résumé soit publié aux frais du conseil.

## Programme de la Section Limnologique.

**Danemark.**

1) Croissance et biologie de la truite de mer, en eau douce et en mer.
2) Recherches de la concentration des ions d'hydrogène dans certaines eaux douces, dans ses rapports avec la distribution de certains poissons et invertébrés.

**France.** Continuation des recherches sur la croissance et la migration des Alosa et Acipenser, ainsi que sur la croissance et la migration des jeunes saumons.

**Finlande.** Continuation des recherches sur le saumon et le coregonus Albula dans la Baltique et les eaux douces.

**Pays-Bas.** Recherches sur la croissance des jeunes saumons et de la truite de mer, en eau douce. Recherches sur le plankton et la faune du fond dans les eaux saumâtres.

**Irlande.** Croissance et biologie du saumon et de la truite de mer, particulièrement en eau douce.

## Programme of the Statistical Committee.

1) That boundaries of each of the Fishing Regions should be fixed definitely, and recognised by all participating countries: and that a Sub-Committee be formed for the purpose of delimiting the regions.
2) That it is desirable that the detailed statistics outlined in the English proposals be obtained, and while it was recognised that at present it was impracticable for some countries fully to obtain these returns, it was agreed that these countries should endeavour to obtain such particulars for a portion of their vessels, the English Department for the present undertaking the tabulation of the material so obtained.

## Programme of the Atlantic Slope Committee.

The Atlantic Slope Committee resolved:

1) That the programme of investigations as adhered to last year should be continued on its main lines leaving to the biologists which have to carry out investigations in this region every initiative.
2) That an investigation as to the growth of the tunny (Orcynus thynnus) and of the long-finned tunny (Thynnus alalonga) should be carried out based on otoliths and scales.
3) That a combined investigation of the biology of the sardine should be undertaken from Gibraltar to the Channel.
4) That an investigation should be carried out as to the effect of petroleum oil on fish, plankton, algæ and littoral fauna, on one side by experiences in aquarium, on the other side, by observations on shore, and finally in the open sea by research ships when circumstances permit.

## Programme of the Cod and Haddock Committee.

The following resolution was passed by the Committee: that the Committee reaffirms its adhesion to the programme of 1921, and considers that special stress should be laid upon investigation of the influence of the fishing on the stock of cod and haddock.

## Programme du Comité Statistique.

1) Que les limites des régions de pêche soient fixées définitivement, et adoptées par toutes les nations adhérentes, et qu'un sous-comité soit formé en vue de cette délimitation.
2) Qu'il est désirable que des statistiques détaillées soient fournies suivant les propositions anglaises. Comme actuellement, il est difficile pour certains pays de remplir ces conditions, les résultats fournis par certains navires appartenant à ces contrées seront transmis au service anglais qui assurera la mise en tables de ces documents.

## Programme du Comité du Plateau Continental Atlantique.

Le Comité du Plateau Continental Atlantique décide:

1) Que le programme de recherches établi l'année précédente soit continué dans ses grandes lignes tout en laissant toute initiative aux biologistes qui auront à faire des études dans cette région.
2) Qu'une étude sur la croissance des thons (Orcynus thynnus) et du germon (Thynnus alalonga) soit entreprise en se basant sur les otolithes et les écailles.
3) Qu'une étude d'ensemble de la biologie de la sardine soit entreprise de Gibraltar à la Manche.
4) Qu'une étude sur l'effet des huiles de pétrole sur le poisson, le plankton, les algues et la faune littorale soit entreprise d'une part, par des expériences en aquarium, d'autre part, par des observations sur les rivages, et enfin au large à l'aide de navires de recherches, quand les circonstances le permettront.

## Programme du Comité de la Morue et de l'Églefin.

Le Comité confirme ses résolutions du programme de 1921 et considère qu'un effort spécial dans les recherches doit être fait en vue d'étudier l'influence de l'intensification de la pêche sur la morue et l'églefin au point de vue quantitatif.

## Programme of the Plaice Committee.

1) In view of the important informations contained in Mr. BORLEY's report on the English Plaice investigations of the last year, the Committee is of the opinion, that it is desirable to have this report printed in the Rapports et Procès-Verbaux.

2) It is desirable that the members of the Committee should prepare a programme for the future work that could be laid before the Plaice conference in 1924.

## Programme of the North Atlantic Committee.

1) The Committee will investigate hydrographically and biologically the North Atlantic region north of Rockall Bank with special reference to the Cod, Haddock, Halibut, Plaice and Herring.

2) The following countries will be represented in the Committee: Denmark, France, England, Scotland, presumably Norway.

3) The following work is proposed for 1924:

**Denmark:** a) Hydrographical-Biological cruise with research ship to Iceland and Faeroes. b) Hydrographical-biological observations to be made from warships stationed at Iceland and the Faroes. c) Analysis of commercial catches made in the area of the Committee.

**England:** a) Analysis of commercial catches made in the area of the Committee, b) further statistical information regarding the product of the fisheries landed in England.

**France:** a) Hydrographical-Biological observations to be made from warships stationed at Iceland. b) Statistical informations concerning Cod.

**Norway:** Programme to be arranged.

**Scotland:** a) Hydrographical-Biological cruises with researchship from West of Scotland to the Faroes. b) Analysis of commercial catches.

## Programme du Comité de la Plie.

1) Par suite des renseignements importants contenus dans le rapport de M. Borley sur les recherches anglaises concernant la plie, de l'année précédente, le Comité pense qu'il est désirable que ce rapport soit publié dans les Rapports et Procès-Verbaux.
2) Il est désirable que les membres du Comité préparent un programme du travail futur qui sera présenté à la conférence internationale de la plie en 1924.

## Programme du Comité de l'Atlantique Septentrional.

1) Ce Comité fera des recherches hydrographiques et biologiques dans la région de l'Atlantique septentrional, située au nord de la latitude du Banc de Rockall, en faisant particulièrement porter ses recherches sur la morue, l'églefin, le flétan, la plie et le hareng.
2) Les pays suivants adhèrent à ce comité:
   Angleterre, Danemark, Ecosse, France et sans doute la Norvège.
3) Le programme suivant est proposé pour 1924:
   **Angleterre:** a) Statistique commerciale dans la région étudiée par le Comité, b) renseignements sur le poisson de cette région, débarqué en Angleterre.
   **Danemark:** a) Croisière hydrographique et biologique en Islande et aux Iles Féroë. b) Observations hydrologiques et biologiques faites par les navires de guerre stationnés en Islande et aux Féroë. c) Statistique commerciale.
   **Écosse:** a) Croisières hydrographiques et biologiques de l'Ouest de l'Ecosse aux Féroë. b) Statistique commerciale.
   **France:** a) Observations hydrographiques et biologiques faites par le navire de guerre stationné en Islande. b) Informations statistiques concernant la morue.
   **Norvège:** Programme à adopter ultérieurement.

## Programme of the Baltic Committee.

1) Detailed fishery statistics should be collected from all countries bordering on the Baltic according to a uniform scheme. The statistics should comprise (a) quantity and value of all food-fishes caught. (b) Number, value and size of fishing vessels, distinguishing between steamers, motor vessels and sailing vessels. (c) Number and kind of fishing gears, and (d) Number of men employed in the fisheries. It is considered important that the statistics should give informa-

tion about the catch for each month of the year or even for still shorter periods.

2) Investigations should be made about the food-fishes in the Baltic, according to the following specified programme:
   a) Investigations regarding the spawning areas of the cod by statement of the occurrence of cod eggs.
   b) Investigations to decide whether the eggs in the various areas are developed into larvae.
   c) Investigations regarding the occurrence of larval and post-larval stages of the cod and also regarding the occurrence of young cods.
   d) Investigations regarding the rate of growth of the cod as well as its age, length and weight at first maturity.
   e) Investigations regarding the food of the cod in the various stages of its development.
   f) Investigations regarding the migration of the cod by marking experiments.
   g) Investigations similar to those cited in a—f should be made also regarding the flounder, the plaice and the turbot.
   h) Investigations regarding the Baltic herring in selected places. These investigations should have the aim of stating the racial characters, the spawning seasons, the rate of growth and the frequencies of the different year-classes as well as the food of the Baltic herring. Special weight should be laid on investigating the influence of a deficit in the oxygen of the deep water on the herring.
   i) Investigations similar to those stated in h) should be made on the Baltic sprat.
3) Simultaneously with the investigations mentioned in 2) the plankton and the hydrographical conditions are also to be investigated.
4) The hydrographical cruises in the Baltic should be continued.
5) Observations from lightships and from adequately situated points on the Baltic coasts should be made on temperature, salinity and currents in the surface and at different depths with a degree of frequency sufficiently high for following the hydrographical variations going on in the Baltic.
6) Serial observations of the oxygen as well as temperature and salinity down to greater depths should be made from selected points say from Christiansø, Visby and from Märket.
7) Continuous observations of the sea temperature by means of recording thermometers should be attempted.
8) Preliminary investigations physical and biological of the bottom deposits in the Baltic should be undertaken by the participating countries.

# REPORT

of

# ADMINISTRATION 1922—1923.

## I. General.

### Composition of the International Council for the Exploration of the Sea.

During the year 1922—23 no changes have occurred in the composition of the International Council.

### Composition of the Bureau.

The members of the Bureau were the same as the preceeding year: Mr. H. G. Maurice, President, Professor Otto Pettersson, Professor Johan Hjort, Mr. Théodore Tissier and the General Secretary C. F. Drechsel.

### Committees.

Besides the ordinary Committees (viz. the Finance, the Statistical and the Editorial Committee) the Herring Committee and the Atlantic Slope Committee have worked during the year. As to the reports delivered to the Bureau by the Herring Committee see page 3.

### Audit of Accounts.

The Accounts of the Council for 1921—22 have been revised and found correct by the Finance Committee, and are to be submitted to the Council for its approval at its meeting in 1923.

A statement is given below of the Accounts for 1922—23, which shall be revised by the Finance Committee.

## Statement of Accounts for the financial year 1922—23.

### Receipts:

| | | | Estimates | Real Receipts |
|---|---|---|---|---|
| I. | 1. | Balance brought forward from 1921/22.. | 93 753.99 | 93 753.99[1]) |
| II. | 2—9. | Annual contributions of the governments for 1922/23..... | 115 000.00 | 115 000.00 |
| III. | 10. | Interest..... | 0.00 | 3 229.64 |
| IV. | 11. | Sales of publications..... | 0.00 | 186.50 |
| | | Total Kr.... | 208 753.99 | 212 170.13[1]) |

### Expenditures:

| | | | Estimates | Real Expenditures |
|---|---|---|---|---|
| I. | 1—6. | Incidental Expenses..... | 25 600.00 | 25 600.00 |
| II. | 7—11. | Assistance..... | 28 250.00 | 26 562.50 |
| III. | 12. | Expenses of the Office in Copenhagen.... | 12 150.00 | 11 582.34 |
| IV. | 13. | Travelling Expenses..... | 7 000.00 | 5 441.08 |
| V. | 14. | Special Resolutions of the Council..... | 12 000.00 | 10 000.00 |
| VI. | 15. | Printing and distribution..... | 28 000.00 | 9 327.72 |
| | | Total Kr.... | 113 000.00 | 88 513.64 |

| | | |
|---|---|---|
| **Receipts** | for the financial year 1922—23..... | Kr. 212 170.13[1]) |
| **Expenditures** | — — — — ..... | - 88 513.64 |
| **Cash balance** | to carry forward to 1923—24 ..... | **Kr. 123 656.49** |

[1]) + Russia's contribution for 1914/15, **Rbl. 14 430.54,** deposited in a Petrograd bank.

Copy of this Statement has been distributed together with the Agenda for the Council meeting.

### Meetings.

Meetings of the Bureau have been held in Hull and in Copenhagen in September 1922 and in Stockholm on the 28th and the 29th June 1923. Present were: Mr. MAURICE, President, Professor O. PETTERSSON, President TISSIER and Captain DRECHSEL.

From the meetings of the Herring Committee in Edingburgh and of members of the Committee, who met in Christiania for the study of Herring Scales, the following reports have been received:

## 1. Report of the Meeting of the Herring Committee in Edinburgh, June 1923.

A special meeting of the Herring Committee of the International Council for the Exploration of the Sea was held in the Office of the Fishery Board for Scotland, Edinburgh, on June 5th 1923 at 11 o'clock. The following members and representatives were present: Norway: Professor J. Hjort, Mr. Einar Lea; Sweden: Dr. Andersson; Denmark: Dr. Kirstine Smith; Belgium and France: Professor Gilson; Irish Free State: Mr. Farran; England: Mr. H. G. Maurice, C.B., Dr. E. S. Russell, Mr. B. Wollaston, Mr. T. Edser; Scotland: Mr. David T. Jones, C.B.E., Dr. A. Bowman, Mr. Menzies.

Mr. Jones welcomed the representatives to Edinburgh and thereafter Dr. Hjort, the first convener of the Herring Committee, was called to the chair.

The Committee desired to put on record their great grief at the death of Mr. Nelson, and to express their deep senses of the loss to the International Council and especially of his loss to Scotland.

A paper was read by Mr. Einar Lea to show that methods of mathematical analysis such as those employed by Miss Sheriff and Professor D'Arcy W. Thompson could be used neither to support nor disprove the annual nature of the rings on the herring scales. The empirical curves of frequency, of which the similarity to theoretical curves of variation cannot be doubted, may arise from and represent processes which have nothing to do with variation or variability in the sense given by Professor D'Arcy Thompson. It is not a method which can determine the nature of the scale rings, it does not suit the problem it sets out to solve.

A paper was read by Mr. B. Wollaston, on "A new method of reading herring scales". Scales of herring after a certain age become "ringy", viz. show ringy growth at all times of the year. On the same fish scales may be present showing widely different numbers of rings. The age of a fish can be read correctly where the numerous edge rings group themselves or where "key" scales (or dorsal scales of normal structure) are present.

A large amount of material — scales, photographs etc. — was shown and examined and discussion followed.

In view of the necessity of obtaining some common basis for the study of these fundamental problems Dr. Hjort extended an invitation to representatives of the various centres to the Laboratory at Christiania where fresh material could

be studied. It was agreed that representatives from England and Scotland should accept the invitation.

Dr. Andersson gave a short account of the work done on age-determination of herring on the Swedish coast stating that the scales were easily read and that the catches in 1920, 1921, 1922 were very rich in year-class 1913.

The Committee met again on Wednesday at 10. a.m. when they were joined by Dr. Redeke (Holland) and Professor D'Arcy W. Thompson (Scotland).

A paper was read by Mr. Einar Lea on the methods of calculating the growth of the herring by means of the scales.

A further paper by Mr. Einar Lea dealing with the whole of the Norwegian herring material is now in preparation.

Dr. Redeke asked whether any further information was available as to the relation of hydrographic conditions and the herring catches. A general discussion followed.

Mr. B. Wollaston exhibited a new herring mark.

The following resolution was adopted. As soon as the three papers by Mr. Einar Lea were printed in Publications de Circonstance and distributed amongst the members of the Committee and the joint investigations completed the Council should ask for another meeting of the full Committee to draw up a programme for further investigation.

(sign.) Johan Hjort (Convener). Alex. Bowman (Recorder).

## 2. Report of the Meeting for the study of herring scales in Christiania, June 1923.

The invitation extended to members of the Herring Committee by Professor Hjort to attend at Christiania for the purpose of adopting similar methods and of coming to some common basis of understanding for cooperation in the study of the fundamental problems with regard to herring investigation was accepted by the following representatives: England: Dr. E. S. Russell, Mr. H. J. B. Wollaston; Scotland: Dr. A. Bowman, Mr. H. Wood; Sweden: Dr. A. Molander; Norway: Professor J. Hjort, Mr. Einar Lea, Professor Gran, and meetings were held daily in Professor Hjort's Laboratory on June 25th—29th (incl.).

Fresh material was available and a large number of herrings were examined methodically by Mr. Lea, scales being taken from all parts of the body. Every facility was given Mr. Wollaston to demonstrate his methods and to furnish evidence in support of his criticisms at Edinburgh.

With regard to the examination of the rings on herring scales the following conclusions were reached by the meeting. When the rings on the scales are distinctly marked and are few in number it is of little importance from which part of the body

the scales are taken. On the other hand, when many rings are found close together on scales on the anterior region of the body near the point of the pectoral fin, the number of rings on the outer part of the scale becomes more and more difficult to count accurately as one proceeds to scales on the posterior part of the body and on the dorsal surface. When therefore the object is to count the maximum number of rings these scales should be chosen which show the fullest development of the rings. This result is in accordance with and in confirmation of those already reached by Mr. Einar Lea (cf. his Canadian Report, Chapt. VI, p. 101, 1919).

"Key" scales as defined in Mr. Wollaston's paper read at the Edinburgh meeting and as exemplified in Figs. 1 and 2 of that paper were not found in the samples examined at Christiania. Two of the key scales exhibited at Edinburgh were re-examined and compared by measurement with ringy scales stated to have been taken from the same fish with respect to the relation between the arrangement of the rings on the key scale and the arrangement on the ringy scale. The fundamental difference found between the system of rings on the key scale in one case as compared with that of the ringy scales presumed to have been taken from the same fish suggested that the so-called key scale belonged to some fish other than the ringy one.

Christiania, 29th June 1923.

(sign.) E. S. Russell. H. J. Buchanan-Wollaston. Alexander Bowman. Henry Wood. A. R. Molander. Johan Hjort. Einar Lea. H. H. Gran.

Resolution:

The English and Scottish representatives, having seen the Norwegian method of reading scales demonstrated by Mr. Einar Lea on samples from the years 1911, 1913, 1917 and 1921 selected by them, and having been satisfied with the results of this demonstration, are of opinion that these methods should be adopted, in the first instance, in the study of the scales of North Sea Herring, and that in view of the fact that skill and experience are required to count accurately the number of rings in a ringy scale, a worker from each country should be sent to Christiania in the autumn of the present year, in response to the kind offer made by Professor Hjort, to study the question under the guidance of Mr. Lea, in order to make himself acquainted with the technique and practice of scale-reading.

Christiania, 30th June 1923.

(sign.) E. S. Russell. H. J. Buchanan-Wollaston. Alexander Bowman. Henry Wood. Johan Hjort. Einar Lea.

## II. Work of the Bureau at Copenhagen.

Besides administrative work, correspondence, etc., the following work has been carried out.

### A. Publications.

Report regarding the Publications issued and cost of same during the financial year 1922—23.

VI. — **15. Printing.**

| | | | |
|---|---|---|---|
| Rapp. & Procès-Verbaux Vol. XXVIII | — 600 copies | Kr. | 1 518.30 |
| — — — XXIX | — 600 copies | - | 2 808.02 |
| — — — XXX | — 650 copies | - | 948.00 |
| Occasional Papers: | | | |
| Publ. de Circonstance Nr. 76, by Prof. Knudsen, | 600 cop. | Kr. | 358.50 |
| — - — - 77, - — Knudsen, | 600 cop. | - | 456.25 |
| — - — - 78, - Mr. A. C. Hardy, | 700 cop. | - | 790.00 |
| — - — - 79, - J. N. Carruthers, | | | |
| — - — - 80, - J. R. Lumby, | | | |
| — - — - 81, - Dr. J. Gehrke, | 600 cop. | - | 233.00 |
| Distribution of Publications | | - | 2 126.30 |
| Unforeseen expenses: Proof-readings, drawings, translations &&. | | - | 89.35 |
| | | Kr. | 9 327.72 |
| | Balance... | - | 18 672.28 |
| | | Kr. | 28 000.00 |

### B. Other Work of the Bureau.

Report of work carried out by the Departments of the Bureau during 1922—23.

#### a. Hydrographical Department.

1. The Department took care of the printing of following papers:
   1) 6 papers in the "Publications de Circonstance", viz. No. 75 to 81 except No. 78.
   2) Rapport Atlantique 1921 (hydrographical part).
   3) Rapport Atlantique 1922 (hydrographical part).

   The priting of this last paper was not completed in the financial year 1922—23.
2. The department has acted as an adviser on scientific and technical problems raised by oceanographers in various countries and has collected hydrographical material from the participating countries in accordance with the regulations laid down in the programmes of the Council.
3. Dr. Gehrke has continued his studies on the after-effect of ice-winters upon deep-sea temperatures of the Kattegat and has published the results in "Publications de Circonstance" No. 81.

### b. Statistical Department.

"Bulletin Statistique" for the years 1914—18 was distributed the 1st of August 1922 to the various countries and the work with the next edition (1919—20) is finished. The work with the "Bulletin" for the years 1921—22 is commenced.

The library, belonging to the Bureau, has been kept up to the present date.

### c. Plankton Department.

The Department has taken care of the printing of:

1) "Publication de Circonstance" No. 78.
2) The Plankton part in "Rapport Atlantique 1921" (Rapp. et Proc.-Verb. Vol. XXIX).

As ordinary the Department has acted as an adviser in Plankton questions.

## III. Work of the Participating Countries in accordance with the Programme of the Council.

### A. General observations.

**Belgium.** Un navire du type yacht, l'"Oithona", a été racheté au Laboratoire de Plymouth. Après réparation et modification en vue de conditions de travail nouvelles, il a été mis en marche et employé surtout pour des travaux de dragages, d'hydrographie et de plancton. Une machine à sonder d'un type nouveau, permettant de pratiquer des coups de sonde en succession rapide par les faibles profondeurs, a été construite et est mise à l'essai.

Les dimensions de l'"Oithona" sont trop faible et ne permettent pas de l'utiliser très activement pour les recherches de grande pêcherie les lieux de pêche étant trop éloignés de la côte.

Des pêches expérimentales ont été faites deux fois par semaine, sans interruption, en continuation de l'étude des conditions générales de la pêcherie littorale entreprise précédemment. Le nombre total des pêches effectuées dépasse trois mille.

**Denmark.** Denmark has on two cruises with the "Dana" in September—October 1922 and April—June 1923 carried out investigations in accordance with the councils resolutions.

Sorting of material from the "Dana" Atlantic expedition and Study of several questions in connection herewith has been made.

Hydrographic and Plankton Research with reference to the resolutions has been carried out.

**Finland.** Cruises have been made in the Northern Baltic, the Bothnic and the Gulf of Finland on the steamer "Nautilus" and in the Gulf of Finland with

the motorboat "Aurelia". Continuous thalassological observations as coastal stations and from lightships have been carried out. Special investigations have been made in lakes and rivers.

**France.** La France a fait exécuter deux croisières par le chalutier "Tanche", et l'Office des Pêches se réserve de faire à la fin de l'automne ou au debut de l'hiver une nouvelle croisière. Les croisières trimestrielles ont été régulièrement exécutées par des navires de guerre (voir Rapport du Comité du Plateau Continental Atlantique, p. 55).

**Great Britain. England.** a) In the period under review the Research Vessel "George Bligh" was kept in full commission except for a few weeks during the middle of winter when she remained in port for overhaul and the carrying out of certain structural alterations and improvements. In all 23 cruises were carried out. During the first half of 1923 work was considerably interfered with by unfavourable weather.

b) In addition to those referred to in the sectional reports the following scientific papers were published in "Fishery Investigations", Series II:

J. O. Borley: "The Marine Deposits of the Southern North Sea", Vol. IV, No. 6, 1923.

F. M. Davis: "An Account of the Fishing Gear of England and Wales", Vol. V, No. 4, 1923.

W. Wallace: "Report on Experimental Hauls with Small Trawls in certain Inshore Waters off the East coast of England", Vol. V, No. 5, 1923.

**Scotland.** During the year, with an increased number of naturalists on the Board's scientific staff, considerable progress was made with the general investigations. In view of the fact that the herring and haddock are so important to Scotland, the energies of the staff were directed largely to the elucidation of problems relating to these two species.

The Research Vessel "Explorer" which visited Copenhagen during the last International Council Meeting in September, 1922, has been practically in continuous commission since that date, with the exception of five weeks during December and January, and the following cruises have been made:

1) September, 1922. Extended hydrographic cruise. Main object — the hydrographic conditions of the northern North Sea and more particularly those of the herring trawling ground.
2) and 3) October, 1922. Trawling cruise. Age determination and size frequencies of haddocks on the inshore and offshore grounds and search for the 0-group.
4) and 5) November, 1922. Plaice and herring investigations in Firth of Forth, St. Andrews Bay, Carnoustie Bay, Moray Firth and Inverness Firth.
6) November—December, 1922. Trawling observations on East Coast of Scotland and experiments with special trawl.

7) February—March, 1923. Trawling observations in Moray Firth, at Orkney and Fair Isle and survey of Orkney grounds by Petersen Grab.
8) April- May, 1923. Extended cruise. a) The 'spawny' haddocks of the Cape Wrath and Butt of Lewis grounds. b) The young year classes of the Faroe haddocks. c) The hydrographic conditions of the Faroe—Shetland Channel and of the North Sea between Shetland and Rattray Head.
9) May—June, 1923. Trawling cruise. Determination of the distribution of the year-old haddocks in the middle North Sea.
10) July—August, 1923. Extended cruise. a) Hydrographic conditions on the Scottish summer herring fishing grounds of the North Sea and on the whaling and herring fishing grounds of the West of Shetland. b) Abundance and limits of the 0-group.

**Ireland.** The work undertaken by Ireland with reference to the Councils resolutions has been carried out as far as the temporary absence of the research vessel would allow.

**Holland.** The continued lack of a research-vessel has prevented Holland from carrying out practical work at sea, and the time has been more occupied with questions regarding inland fisheries. In June and July of this year a prolonged cruise has been made with the Dutch mission-vessel "De Hoop" to the Shetland herring grounds as a preliminary attempt of investigations about hydrographical and biological conditions of the herring fishery. Time has not yet permitted to discuss the results of the cruise.

A monograph on the flora and fauna of the Zuiderzee has been prepared by Dr. Redeke with the assistance of numerous specialists and was published in May 1923.

**Portugal.** A new mareograph has been established on the Isles d'Açores and will be working from the beginning of September. The mareograph hitherto in use at the Iland Fayal is continuing work there.

**Sweden.** Sweden has carried out herring investigations in Skagerak and Kattegat, in the North Sea and the Norwegian Channel. Investigations of cod and haddock — of cod in particular in the Baltic — have been carried out as well as Hydrographic observations and experimental Plankton research. Several publications have been issued, especially about Baltic and Limnological work.

## B. Investigations.

### a. Hydrographical Work.

*(For Programme, see Procès-Verbaux Vol. XXVIII p. 28.)*

**Belgium.** Continuation des observations météorologiques journalières et reprise des prélèvement hebdomadaires d'échantillons d'eau de surface et de fond, à bord du bateau-phare West Hinder.

De nouvelles expériences destinées à compléter les recherches précédentes sur la dérive dans la Mer du Nord ont été faites. Elles comprennent entre autres,

des jets de 150 flotteurs accouplés, au West Hinder et, au même instant, au Kentish Knock.

Les recherches sur les variations de la quantité d'oxygène n'ont pu être reprises que très récemment.

**Denmark.** Denmark has carried out the measurements undertaken at Christiansø of temperature, salinity etc., and current-measurements at Horns Reef. The measurements at Schultz's Grund and Halskov, eventually to be dealt with, have not been carried out. The usual surface observations from North Sea and Atlantic Liners have been made. Observations from Baltic lightships and coastal stations are undertaken by the Danish Meteorological Institute and hydrographic measurements from the "Dana" during her Baltic cruises and in connection with biological work. Examination of various materials has taken place.

**Finland.** 1920. March. Res. 2. The surface observations of salinity and temperature on the line Helsingfors—Hull have been continued.

1920. March. Res. 12. At 108 stations along the coast of Finland daily observations of ice and weekly charts of icecover have been made.

1920. March. Res. 15. One new tidalgauge (Sortanlahti) is working, four are in construction (Mäntyluoto, Degerby, Wiborg and Björkö).

**Great Britain. England.** Daily surface temperature and salinity observations have been made at the Smith's Knoll and Varne Light Vessels; and at the Seven Stones similar observations have been made every fourth day.

The Jacobsen current meter work has also been in progress at the two former Lightships, and the tabulated records transmitted from time to time to the Central Bureau.

Surface observations on the commercial routes have been continued according to the programme with the following modifications:—

a) The Liverpool to Charente route finished work at the end of 1922.
b) Surface observations were started in June 1923 across the North Sea on the route Hull to Copenhagen, instead of Harwich to Hook of Holland as contemplated in the programme.
c) The Tyne to Naze of Norway observations have been extended to include the extra distance from the Great Fisher Bank to the Norwegian coast. For the rest the observational routes are as laid down in the 1922 programme.

Special hydrographical cruises were undertaken north of the Dogger Bank in October 1922, and again in May 1923, and in addition opportunity was taken to make hydrographical observations during cod-egg cruises in the spring of 1923, in the Flamborough Off region. In particular a section was obtained in March 1923 between the Great Fisher Bank and the Yorkshire coast.

In the winter 1922/23 hydrographical observations were made in the southern North Sea and the English Channel, during the young herring cruises.

Four liberations of drift bottles, comprising 100 each of the bottom trailing

and surface floating types, have been made in connection with definite fishery problems.

The hydrographical material for the year 1914—19 has been despatched to the Central Bureau, but it has not yet been possible to transmit the data for 1922, though it is hoped to forward these before the 1923 meeting of the International Council.

The following papers have been published:

J. N. Carruthers: "Investigation of Non-tidal Water Movements North of the Dogger in October 1921". Publications de Circonstance, No. 79, April 1923.

J. R. Lumby: "The Salinity and Temperature of the Southern North Sea and English Channel during the period 1920—21". Publications de Circonstance, No. 80, April 1923.

**Scotland.** On all the cruises of the research vessel the collection of hydrographical data was carried out as part of the regular programme. For the study of the magnitude and direction of flow of the Atlantic Stream penetrating the northern North Sea hydrographic sections were examined on the following cruises: September, 1922, Udsire Light to Moray Firth; February, 1923, Rattray Head to Fair Isle; April—May, 1923, Butt of Lewis to Faroe Bank, Faroe to Shetland, Sumburgh Head to Rattray Head; July—August, 1923, Scottish summer herring fishing grounds and north of Shetland.

During the extended trawling cruises hydrographical observations were made to explore the nature and extent of the cold bottom water layers in the northern North Sea. Care has been taken to repeat, as often as possible, observations along the lines of the fixed stations of the International programme of earlier years. Observations of temperature and salinity were also carried out at representative stations in the Moray Firth and on the East Coast of Scotland during the trawling excursions. Samples for the determination of the oxygen contents of the different water layers by the WINKLER method were collected at selected stations.

Daily temperature observations have been obtained from Rattray Head Lighthouse and the North Carr Lightship since September, 1922, and similar observations are available since January, 1923, from the following lighthouses:— Fair Isle, Out Skerries, North Ronaldshay, Stroma, Monach and Ailsa Craig, and from Abertay Lightship.

In September, 1922, on the lines between the Spurn and Skaw and between Udsire Light and the herring trawling grounds of the northern North Sea 400 surface drift bottles and 400 bottom trailers were liberated. Between the Butt of Lewis and Faroe Bank 50 surface drifters were liberated in April, 1923.

**Ireland.** The work to be carried out on the lines as in 1921 and 1922 (Procès-Verbaux 1922, p. 30) has not been made, no ship having been available.

**Holland.** Collection of water samples at a number of stations on the herring grounds has taken place at depths of 100, 75, 50 and 0 m.

The customary observations of temperature and salinity along steamer routes and on board lightships were continued and extended to a third lightship "Terschellingerbank".

**Portugal.** The recommendation of the hydrographical section (see Procès-Verbaux, 1922, p. 26) as to investigations on lines from Lisbon to the Azores and those of the Atlantic Slope Committee (see Procès-Verbaux, 1922, p. 36) have not been carried out owing to lack of ship available.

**Sweden.** a) Surface-observations on the temperature and salinity of the North Atlantic and the North Sea have been carried on continuously during the whole year 1922 on board the Swedish steamers flying between Gøteborg and New-York. The water samples collected being analyzed at the laboratory of Gøteborgs Högskola.

b) A great number of hydrographical sections across the Norwegian Channel, Skagerak and Kattegat have been made in connection with the research on the herring, the cod and haddock, mentioned below.

c) By means of automatically registering instruments, the movement of the deeper water layers has been registered continually at the station Bornø. The results of these observations lead to the conclusion that the movements of the deeper strata in the Ocean and in the atmosphere are periodical and are regulated by cosmic agents. The influence of these agents rules the winter climate of Northern Europe as shown in a paper entitled "Innere Bewegungen in den Zwischenschichten des Meeres und der Atmosphäre".

d) The Swedish Government having conferred the observations made on board Swedish lightships to the care of the Swedish Commission, there has been introduced a new regime in this system of observations, and the old series of observations of 40 years have been collected and made ready for publication.

### b. Plankton Work.

*(For Programme see Procès-Verbaux Vol. XXVII p. 36 and Vol. XXVIII p. 26.)*

**Belgium.** Une prise verticale de plancton est faite chaque semaine, en même temps que la prise d'échantillons d'eau pour la chlorimétrie au West-Hinder. L'emploi de la formaldéhyde en solution neutralisée est en expérimentation.

Un filet spécial permettant de pêcher sur les fonds pierreux pour y recueillir les organismes se tenant tout près du fond a été construit et est à l'essai.

**Denmark.**

Ad. 1921—2. In cooperation with the Hydrographic Laboratory a new horizontal Plankton net has been constructed and tried. After various alterations in the construction the net has proved to be fit for use. The trials cannot however be considered finished as yet.

Ad. 1921—7. The typical collection of Plankton organisms has been completed by further collections.

Ad. 1922—1. Microscopic investigations of the stomach contents of a large material of young herrings have been undertaken. The Plankton Laboratory has received these herrings from Esbjerg during the winter season 1922—23.

During the "Dana" cruises in the autumn of 1922 and the spring of 1923 a large material of herring larvae has been collected, of which the contents of the stomach have been examined. During the collection of these larvaes samples of Plankton have been gathered for comparison with the analysis of the stomachs.

During the hydrographic research off the east coast of Bornholm Plankton has been collected.

Ad. 1922—3. A list has been made of the Plankton organisms belonging to the typical collection of the Laboratory.

**Finland.** The investigations of the plankton and littoral vegetation in harbours and coastal waters are continued, also investigations on the correspondence between the plankton and chemical properties of the water.

**Great Britain. England.**

*Rec. 1921.* Para. 1. No specifications have been received for the new standard net, so plankton samples have been collected as in previous years with Hensen, Nansen and Apstein nets.

Para. 5. All samples examined are estimated numerically.

Para. 7. Additions have been made to the type collection, and a list prepared.

Para. 8. Micro-plankton samples have been collected on all herring larvae and cod-egg and larvae cruises.

*Rec. 1922.* Para. 1. a) A survey of the plankton of the herring fishing ground (25 miles E.N.E. from Tyne) was carried out during July 1922.

b) Experiments have been carried out during the mackerel and herring seasons with a new instrument — the torpedo Plankton Indicator; the instrument is designed to correlate the catches of fish with the plankton. Some 20 different boats have used or are using the instrument and interesting records of distribution of plankton in the fishing areas are being obtained.

c) Food of the Herring. The examination and quantitative analysis of the stomach contents of larval, post-larval, whitebait and mature herring has been continued, and up to date over 5000 have been worked up. A report on these will probably be ready by the end of the year.

Plankton samples have been taken in the vicinity of herring shoals.

d) Food of the Oyster. A quantitative examination of the stomach contents of oysters has been begun, and so far 30 stomachs have been examined. Plankton samples from the oyster beds are also being examined.

Para. 2. See note under Para. 1. (1921 Recommendations).

Para. 3. See note under Para. 7. (1921 Recommendations).

Other Plankton Work. During November 1922 a special cruise was made to chart the occurrence of the diatom *Rhizosolenia styliformis* which has been found in dense masses at the end of October 1921 at about 54° N. Lat., 3° E. Long., and at Smith's Knoll Light Vessel.

A line of 6 stations between Flamborough Head and the S.W. patch of the Dogger Bank is being worked at intervals of two months, in place of the proposed fixed station.

Reports published during the year:

A. C. Hardy: "Notes on the Atlantic Plankton taken off the East Coast of England in 1921 and 1922". Publications de Circonstance, No. 78, 1923.

R. E. Savage: "The Macroplankton of the Plaice-egg Cruise 1920—21". Fishery Investigations, Series II, Vol. 5, No. 6, 1923.

**Scotland.** Plankton samples have been obtained both on the special and on trawling cruises and collections have been systematically made by the GRAN method. During July—August a special survey was made of the Scottish herring fishing grounds and the grounds to the west of Shetland to ascertain the plankton content of the water masses.

The use of neutralised formaline for the preservation of plankton samples has been continued.

**Ireland.** No further collections have been made. The Macroplankton collections in hands have been nearly all worked out. The microplankton samples have been in part worked out but the work has been suspended owing to reduction of staff.

**Holland.** Horizontal hauls have been carried out by means of the young fish trawl and a large plankton net (net diameter 1.10 m) at different depths.

**Sweden.** Experimental researches of the growth of plankton were made by Dr. NYBELIN in connection with those instituted in Norway by professor GRAN.

### c. Statistics.

*(For Programme see Procès-Verbaux Vol. XXVII p. 44 and Vol. XXVIII p. 34.)*

**Belgium.** Le Service statistique du marché d'Ostende a été partiellement réorganisé. Cependant de nouveaux obstacles ont surgi: le personnel de la minque éprouve de grandes difficultés à rétablir les procédés de triage et de vente qui, avant la guerre, permettaient de tabuler avec une précision satisfaisante les lots de toutes les catégories mises en vente. En outre, ce personnel est trop restreint pour faire face aux nécessités de la notation exacte de la taille par espèces.

Cependant les données statistiques désirables concernant la plie et le hareng peuvent être recueillies et sont envoyées au Bureau central.

**Denmark.** The general statistics of catch are collected and published for

each of the principal waters round Denmark, viz. the North Sea, Skagerak, Kattegat, Belt Sea, Sound, Western Baltic and True Baltic. Besides this a great material is collected upon which more detailed statistics can partly be worked out, e. g. catch per month, catch per fishing day and per cutter, etc.

**France.** La difficulté de recruter un personnel spécial, en France pour ce travail, par suite des embarras budgétaires et de l'appauvrissement en hommes du pays à la suite de la guerre, a empêché d'entreprendre ce travail.

**Great Britain.** The resolution, partitioning the fishing regions into geometrical areas, adopted by the Council in July 1921, and amended at their next meeting in September 1922, is now used in England to the exclusion of any other method. No insuperable difficulty was experienced in bringing it into use: and it has already proved to be of considerable value. By its aid the statistics of large trawlers and liners for both England and Scotland can now be combined, and as a result a monthly picture can be presented of the quantity of each kind of fish taken from each rectangle and the time expended in catching it. In the North Sea the general agreement of the trend of the catch per 100 hours fishing in adjacent rectangles, and from month to month, is evidence that subdivision has not gone too far.

**Scotland.** In accordance with the resolution of the Statistical Section squared charts are now in use for the purpose of showing fishery results.

**Ireland.** Statistics of quantity and value of fish landed have been sent regularly to the Bureau.

**Holland.** A great improvement of our statistics has been that after a considerable trouble all the landings of the Dutch steam-trawlers in Ymuiden are tabulated according to the fishing grounds A2, B3, etc., month for month, and the yield of each kind of fish for each day absent from port is also stated. Most of the voyages, of which exact details of the total catch were available, could be assigned to a particular fishing ground; only a small percentage had to be treated as "undistinguished", owing to the hauls being too much scattered. At present we possess monthly statistics of the various fishing grounds of the southern North Sea from October 1922—April 1923.

### d. Herring.

*(For Programme see Procès-Verbaux Vol. XXVII p. 28 and Vol. XXVIII p. 24.)*

**Belgium.** Outre les données statistiques, des matériaux pour l'étude du développement des clupéides ont été recueillis, près de la côte belge et de la côte française jusqu'au Cap Grisnez et envoyés au laboratoire de Lowestoft pour y être étudiés en collaboration.

**Denmark.** On two cruises with the Danish research steamer "Dana" in September—October 1922 and April—June 1923 the following work concerning the herring has been carried out:

1) Location of the spawning places for the autumn spawning herrings in the area round the Jutland Bank and the eastern Kattegat. (September—October 1922.)
2) Investigations of the distribution and frequency of the larval stages of the winter spawning herrings in the Skagerak, Kattegat and the Belt Sea. (April—June 1923.)
3) Investigations as to the racial characters of the herrings spawning in different localities.
4) Investigations as to the rate of growth of young herrings.
5) Investigations as to the food of young of herrings.
6) Marking experiments with herrings in the eastern Kattegat. (October 1922.)

The laboratory work has mainly consisted in race-studies of herrings in connection with age determinations.

Statistics are collected in the usual ways.

**Finland.** See Baltic Committee p. 31.

**France.** Aucun fait nouveau n'a modifié les conclusions de la note publiée dans le rapport de 1922, par M. Belloc sur la limite méridionale de la distribution géographique du hareng.

Des études sur les races locales sont en cours, aussi bien à la station aquicole de Boulogne-sur-Mer, que dans la baie du Mt. Saint-Michel.

**England.**

1) These statistics are collected in full by the Ministry at all the chief ports, and are being studied.
2) In 1922 eighteen unsorted samples of herrings, caught by drifters, were examined as to size, weight, sex and maturity, and scales were taken for age determination. In 1923 thirty-eight samples were examined up to July 14th, and the work is continuing. The publication of the material is being postponed until the end of 1923, as the sampling during 1922 is not considered to be of a sufficiently continuous nature.
3) Two experiments with a mixed fleet of drift nets were made from the "George Bligh" in July 1923 on the Northumbrian drifting grounds, with interesting results.
4) a) The Petersen Young Fish Trawl was used for the capture of larvae and post-larvae on five cruises of the research vessel.

   The material collected during these cruises of the S.S. "George Bligh" was supplemented by collections made by the Marine Biological Association from S.S. "Salpa" in the western part of the Channel during January and February; and also by collections made by Professor Gilson from S.S. "Oithona" at West Hinder Light Vessel and off the Belgian coast during the period February—May. The material from the two last mentioned sources has been sent to Lowestoft to be worked up in conjunction with the collections of the "George Bligh".

b) Measurements were made of 4,300 young herring of the 0 group captured in the littoral region at various places between Bridlington Bay and Aldeburgh inclusive. These herring were taken chiefly by means of a sand-eel seine, with fine-meshed centre.

5) Some preliminary work on the rate of growth of herrings has been carried out, both by the study of the scales and direct measurements of the age-groups of fish taken at different times of the year.

6) This work has been postponed until the length and age data have been worked up.

7) A search was made for herring spawn and records of the capture of spawning haddocks were obtained from commercial vessels.

8) and 9) (See under Plankton Section.)

10) Nearly 300 drift-caught herring were marked in July 1923. The mark used consists of a band of thin red celluloid joined at the ends by a nickel-silver spring. Though the herrings swam away in a lively manner it is feared that the injury due to the net may result in the subsequent death of the fish, and arrangements are being made to test the matter by tank experiments.

11) a) Temperature of sea and water samples at various depths were taken at stations where the Petersen Young Fish Trawl was used for the capture of larvae and post-larvae in the Southern Bight and English Channel in November and December 1922 and in January and February 1923.

b) 100 surface and 100 bottom drifters were liberated at each place and date as follows:—

| | |
|---|---|
| 13. XI. 22 | 53° 1′ N; 1°36′ E. |
| 19. XII. 22 | 51°40′ N; 2° 9′ E. |
| 30. I. 23 | 50°10′ N; 1°22′ W. |

In co-operation with the Ministry investigations on herring in the Irish Sea were carried out by the staff of the Oceanographical Department, University of Liverpool, and the following paper published:—

H. Birtwistle and H. Mabel Lewis: "Scale Investigations on Shoaling Herrings from the Irish Sea". Report for 1922 of the Lancashire Sea Fisheries Laboratory (1923) pp. 64—86.

**Scotland.**

1) Yearly and monthly statistics of the herrings landed from each fishery according to weight, value, methods of fishing, and places of capture are kept in detail for all ports by the Fishery Officers of the Board.

2) During the great summer herring fishing unsorted samples (1/4 cran) from the areas within which drift-net fishing was prosecuted were fully examined. Last year a scheme was drawn up whereby the scientific staff were able to collate the special statistics of the herring fishing obtained at the various ports and

the detailed observations of samples sent to the laboratory from the various fishing grounds throughout the season with information collected through co-operation with fishermen who were provided with special forms. The data for 1922 have been worked up and a paper on the subject is in the press ("Observations on the Scottish Summer Herring Fishing of 1922", by Mr. Henry Wood, M.A. Fisheries Scotland Scientific Investigations, 1923, II, June, 1923.)

3) Unsorted samples of trawl-caught herring have also been examined in detail.
4) Experiments with small-meshed nets have been carried out for the capture of the younger year classes. These have been captured only in the coastal and estuarine waters.
5) Collections of scales have been made from all unsorted samples examined. A critical examination of the age determination by scale rings is in progress.
6) The samples collected the previous year for the determination of race differences by means of a study of morphological characters are being worked up.
7) The furnishing by fishermen of information as to the localities of capture of 'spawny' haddock has provided facilities for making a comprehensive survey of the herring spawning grounds. During the years 1921 and 1922 systematic observations were carried out at the various fishing ports as to the occurrence of 'spawny' haddocks and the data have now been worked up and a paper by Dr. Bowman on the "Spawny Haddock — The Occurrence of 'Spawny Haddock' and the Locus and Extent of the Herring Spawning Grounds" (Fisheries Scotland Scientific Investigations, 1922, IV, April, 1923) has been published. Search was made for herring spawn by means of the Petersen Grab on the Spring spawning grounds in the neighbourhood of Orkney and to the north of Scotland. Spawn was obtained only in the neighbourhood of Cape Wrath. Further collections of larval and postlarval clupeoids have been made and are now being examined.
8—9) The food contents of the stomachs of the samples of herring examined are recorded.
10) No practical marking method has been devised for the investigation of migrations.
11) Hydrographical observations have been made in connection with the biological investigation (see under Hydrography).

**Ireland.**

1) Statistics collected and sent periodically to Mr. Lea.
2) 14 representative samples examined and their scales preserved.
3) The food of most of the above samples has been determined.

**Holland.** In June and July 1923 Dr. Tesch made a series of observations on herring on board "De Hoop" in order to collect data on the distribution of the herring shoals off the Shetland and Scottish coasts.

The food condition, the sexual stage, and the food itself of a number of herrings were investigated; of about 40 individuals the vertebrae were counted.

**Norway.** Two reports by Dr. Lea have been received.

**Sweden.** Reconnoitring expeditions with the research steamers "Skagerak" and "Kattegat" have been made every week during the winter 1922—23 from the 18th October 1922 to the 17th March 1923 in order to follow the wanderings of the herring shoals and give notice to the fishermen. Hydrographic observations have been executed daily, plankton and scales, vertebrae etc. of the fishes have been collected.

Two reconnoitring expeditions in the North Sea and in the Norwegian Channel in order to find herring shoals outside Swedish waters were executed, one in September 1922, the other in May 1923. As corresponding researches have been made by the Danish Commission in the eastern part of the North Sea at the same time it seems desirable that both results should be discussed in the Fishery Section at the next meeting of the Council.

Investigations regarding the races and year-classes of the herring have been continued in the Skagerak, the Kattegat and the Sound. Investigations regarding the races of the herring (strömling) in the Baltic have been commenced.

In connection with plankton investigations, investigations regarding the food of the herrings and young herrings have been made.

### e. Sprat.

**Belgium.** Les matériaux recueillis dans les pêches littorales régulières sont comptés et mesurés et constitueront une contribution à l'étude de ce poisson et de sa pêcherie sur nos côtes.

### f. Cod and Haddock.

*(For Programme see Procès-Verbaux Vol. XXVII p. 32 and Vol. XXVIII p. 38.)*

**Denmark.** Measurements of all specimens captured in the fishing experiments from the "Dana" in 1922 and 1923 have been carried out.

Determinations as to size of age of cod at first maturity have been carried out in the Baltic.

Investigations as to the distribution and frequency of young of cod in the eastern part of the North Sea, the Skagerak, Kattegat, Belt Sea and Baltic have been carried out.

Marking experiments with large specimens of cod have been undertaken in the Baltic (June 1923).

General statistics are collected.

**France.** Ainsi qu'en 1922, la République Française a continué, par un accord entre l'Office des Pêches Maritimes et la Marine Nationale, les recherches entreprises sur la biologie de la Morue sur le Banc de Terre-Neuve.

M. Ed. le Danois a pu faire, pendant le mois de Juillet, des recherches dans cette région, à bord du navire de guerre "Ville d'Ys".

Ces recherches sont faites en accord avec le "Deep Sea Fisheries Marine Investigations Committee", qui comprend, outre la France, les Etats-Unis, le Canada et Terre-Neuve.

Les résultats des recherches françaises en 1921 et 1922 sur le Banc de Terre-Neuve feront l'objet de publications éditées en France et au Canada.

**England.**

1) Quantitative egg work was carried out on lines extending about 50 miles from the coast in a direction about E. by N., magnetic from Flamborough, Whitby, Hartlepool, Tyne, Coquet and Longstone respectively.
2) Drift bottles were liberated on the Great Fisher Bank during the spawning season with a view to obtaining information on the hydrography of the spawning ground.
8) Measurements of unselected samples of catches of Cod on commercial vessels have been carried out on a considerable scale.
9) The study of market statistics has yielded valuable results.
10) The food of the cod has been studied at North Shields during May, June and July.
11) Material for study of age-determination by scales in connection with the marking experiments has been collected.
12) The determination of size at first maturity has been effected, though perhaps the figure arrived at needs further confirmation.
13) Marking experiments have been repeated with a view to the gradual accumulation of sufficient data to obtain adequate knowledge of the seasonal migrations.

A preliminary report on the cod investigations to date will be presented to the Committee.

The following paper was published by the Ministry during the year:—

E. S. Russell: "Report on Market Measurements in relation to the English Cod Fishery during the years 1912—14". Fishery Investigations, Series II, Vol. V, No. 1, 1922.

Co-operative work on cod in the Irish Sea is reported upon in the following paper:—

J. Johnstone, W. C. Smith, and R. A. Fleming: "Investigations on the Cod". Report of the Lancashire Sea Fisheries Laboratory for 1922 (1923) pp. 51—63.

**Scotland.** The trawling cruises of the research steamer were directed mainly to the investigation of the special problems relating to the haddock on the lines laid down by the International Council. Whilst researches on all the items in the programme were conducted, much preliminary work was carried out specially with a view to the testing of the scale theory and its general applicability to this species. (The sections refer to the recommendations of the Cod and Haddock Sub-Committee of the International Council, Procès-Verbaux, Vol. XXVII, p. 34, July, 1921).

1—5) During the early months of the year the physical and hydrographical conditions on the haddock grounds were noted and collections were made of eggs and larvae.

6—7) An intensive study of the distribution of the 0- and the 1-groups in the northern North Sea has been carried on throughout the year by means of the small-meshed net on the cod-end of the otter trawl. The 0-group (1922) proved to be very scantily represented in the northern and western part of the North Sea. There are indications that the 1923 brood will be richly represented in the area.

8—9) Extensive and representative statistics have been obtained from the Aberdeen Market Statistics and from the measurements made by the English and Scottish Fish Measurers who accompanied commercial vessels to the various fishing grounds. The more detailed work was accomplished on board the research steamer and in the Aberdeen Fish Market.

10) The stomach contents of the haddocks and competing species caught were determined on board the research steamer. Special observations with the Petersen Grab were made on the haddock grounds to ascertain the quantity of food available.

11) Many thousands of scale samples from the North Sea, West of Scotland, Faroe and Iceland have been obtained and the readings of these have been kept up-to-date. In addition, samples were obtained from England and Norway and the results have been incorporated in a general review which is in the press — "Problems in Haddock Biology with special reference to the validity and utilisation of the scale theory" by Mr. Harold Thompson, M.A., B.Sc. (Fisheries Scotland Sci. Invest., 1922, No. V, May, 1923). Tank experiments have been in progress for a number of months.

13) Marking experiments with haddock at sea have not yet been carried out but tank experiments have been successfully carried out with a view to obtaining a suitable mark. Haddocks caught by line were utilised for the purpose.

14) Experiments have been made with special trawls.

**Holland.** No investigations. Samples of cod and haddock scales were sent to Dr. Bowman.

About cod and haddock no casual observations have been made, but a number of hauls with the Petersen's young-fish-trawl may reveal eggs and larvae of both species.

**Sweden.** The systematic research on this subject carried on by Dr. MOLANDER has been continued, the results will appear in a paper which is to be published by the Swedish Commission.

Investigations have been made regarding the spawning of cod and haddock in Kattegat and Skagerak.

### g. Plaice.

**Denmark.** Investigations as to the density of the Plaice population and the rate of growth of Plaice have been carried out in the following depth areas:
North Sea: $A_3$, $B_4$, $B_5$, $C_2$.
Skagerak: The areas A, B and C off the North-west coast of Jutland.

Measurements of Plaice landed by Danish cutters in Esbjerg in September and October 1922 have been undertaken.

A report has been prepared on the Plaice population in the Horns Reef area in the autumn of 1922.

**England.** During the year ten measurers have been employed measuring fish, almost entirely Plaice, Cod and Haddock on Commercial Fishing Vessels and on the Markets. The work was for some months largely devoted to the collection of data concerning Cod, but latterly Plaice was the chief object of the work, and throughout the whole twelve months a large amount of information was obtained. The majority of measurements were made on steam trawlers, but steam seiners, sailing vessels, both with and without auxiliary motors, were also utilised; in all cases unselected samples being first treated. The shore measurements were designed to furnish information as to the size composition of the Market categories.

The Otolith material collected during 1922 has been examined. The results demonstrated a slight increase of growth rate which, however, has not yet returned to that of pre-war years. The locus of maximum abundance of each of the early year groups is further from shore than in 1920. There is evidence that the great accumulation of old Plaice, which was so marked a feature of the catch in 1920, has been greatly reduced by 1922. In May 1923 continuous trawling was carried out along the line Leman-Haaks an otter trawl being used with the cod-end covered with shrimp net. Eighteen hundred and twenty otoliths were collected and are under examination.

The work upon the benthos which was mentioned in the Administrative Report for 1921—22 has been continued and extended, the Petersen Grab being employed throughout. In October 1922 and February 1923 the Dogger Bank and some ground adjacent were explored, in May 1923 samples were taken between

the Swarte and Haaks Light Vessels, and in June 1923 a cruise was made in the Southern Bight and from Swarte Light Vessel to White Bank.

The work on the Dogger has revealed enormous patches of molluscs which form a large proportion of the food of Plaice, Spisula and Mactra. A report on this work is in the press.

A transplantation experiment was carried out in May between the Danish Ground and the Dogger Bank by Mr. G. T. Atkinson, District Inspector in H. M. S. "Dee", whose Commander, Lieut. Commander V. Harris, D. S. C., rendered every assistance. This experiment was made possible by the courtesy of the Admiralty and of Captain E. G. R. Evans, Captain of Auxiliary Patrol and by the cordial co-operation of Dr. Johansen with the Danish Research Vessel "Dana". Over 800 Plaice were dealt with.

By the courtesy of Dr. Petersen Mr. Borley was enabled to witness arrangements for the transplantation of Plaice which has been carried out for years in the Lim Fjord. Dr. Petersen demonstrated also the entire system of researches by which the productive powers of the various portions of the Fjord are estimated, and whereby the number of Plaice which it is advisable to transplant is controlled.

The following reports dealing with Plaice have been completed.

| | |
|---|---|
| H. J. B. Wollaston: | "The Spawning of Plaice in the Southern Part of the North Sea in 1913—14". Fishery Investigations, Series II, Vol. 5, No. 2, 1923. |
| J. O. Borley & Collaborators: | "The Plaice Fishery and the War". Fishery Investigations, Series II, Vol. 5, No. 3, 1923. |
| J. O. Borley and D. E. Thursby-Pelham: | "Report on the English North Sea Plaice Work of 1921". (Presented to Plaice Committee of the International Council). |
| In preparation: | |
| J. O. Borley and D. E. Thursby-Pelham: | Complete report on English Plaice Work in the North Sea to March 1923. |
| J. N. Carruthers: | Report on Plaice Marking Experiments. |

**Scotland.** Plaice, Lemon Sole, and Common Dab. Although the more intensive investigations on the plaice have come to an end, attention has still been directed to the fish caught during the routine trawling experiments. Age-determination is still being continued by the examination of collections of otoliths from representative samples. This work has also been extended to areas outside the North Sea. A limited number of marking experiments have been made, more particularly on small plaice under 25 cms. and on plaice caught on the grounds to the north of Scotland.

Previous marking experiments with lemon sole and common dab have been confined largely to the Moray Firth area, but last year a considerable number of both species have been marked and liberated in several other areas.

The data of the returned fish are also being utilised for the purpose of age-determination.

Petersen Grab. In the cruise of the "Explorer" the Petersen Grab was used as part of the routine work of the ship at the various stations visited. The material collected to December, 1922, has been worked up and a report on the results published ("Preliminary Survey of the Scottish Waters of the North Sea by the Petersen Grab", by A. C. Stephen, B. Sc., A. I. C. — Fisheries Scotland Sci. Invest., 1922, III, March, 1923). More recent work has considerably amplified and confirmed the results of the preliminary survey. More intensive work has been done on plaice and haddock grounds with a view to correlating the food contents of the stomachs with the quantity of food on the grounds.

**Holland.** The investigations on the variations in the food of inshore plaice were continued. A report of the results of these investigations is in preparation and will be published shortly.

**Sweden.** See Baltic Committee p. 31.

Regarding plaice, investigations have been made as to their occurrence in the fjords on the west coast of Sweden. The marking experiments have given interesting results in tracing their wanderings. Thus several plaice which have been marked in the fjords mentioned above have emigrated far out in the North Sea. The occurrence of the plaice in the southern part of the Baltic has also been the object of observations.

Investigations have also been made regarding the witch, especially to find a reliable method for age determination.

### h. The Committee of the Atlantic Slope.

*(For Programme see Procès-Verbaux Vol. XXVII p. 46 and Vol. XXVIII p. 36.)*

**England.** Para 4. In accordance with the arrangements made at the meeting of the Interdepartmental Committee on Fishery Investigations held in Dublin on April 5th, 1921. the International Hydrographic Stations L1 to 6, E1, E2, E3 between Plymouth and Ushant, N1 and N2 between Ushant and the Scilly Isles, N3 and E6 in the Bristol Channel, have been worked periodically by the S. S. "Salpa", of the Marine Biological Association.

All the data obtained are communicated to the International Council at Copenhagen, L'Office Scientifique et Technique des Pêches Maritimes at Paris and to the Ministry of Agriculture and Fisheries at Lowestoft, the salinity of the samples of water being determined by the Government chemist. An account of the general movement of the waters in the neighbourhood of Plymouth and of the

seasonal variation is being published from time to time in the Journal of the Marine Biological Association, while a general review of the whole Atlantic Slope has been undertaken by the French Fisheries Department.

Since April 1921 up to the present time the Station E1 has been worked monthly together with the series of Stations L1 to L6 between E1 and the shore; these short monthly cruises have brought to light variations which escape observation when the data are collected at longer interwals, as was the case formerly. Cruises to Ushant and thence to the Bristol Channel have been made during

| | |
|---|---|
| July..... | 1921, 1922, 1923 |
| Nov. ..... | 1921, 1922 |
| Feb..... | 1921 |
| March ..... | 1922, 1923 |
| May..... | 1922, 1923 |
| June ..... | 1922, 1923 |

the stations being worked as the state of the sea permitted.

Several features of hydrographical interest have arisen of which perhaps the most noteworthy is the current of warm high-salt-content water which came into the mouth of the Channel from the south-west from September to December in 1921 and which was coincident with an unusually warm and late autumn.

The opportunity these cruises has afforded has been utilised by Dr. W. R. G. Atkins to determine both on the spot, and by samples brought back to the Laboratory, the variations in hydrogen-ion concentration of the waters of the mouth of the English Channel, and has been further utilised by Dr. M. V. Lebour to determine the variations in and distribution of the plankton fauna.

**Ireland.** Nil. Ship not available.

**France.** France has worked out a special report.

a) Par un accord avec la Marine Nationale, les croisières trimestrielles prévues le long du 48° 30 N jusq'au bord du plateau continental, ont été régulièrement exécutées par des navires de guerre. Les premiers résultats de ces croisières paraîtront dans le rapport du Comité Atlantique de 1923.

b) L'Office Scientifique et Technique des Pêches Maritimes a, dès à présent, fait exécuter deux croisières par le chalutier "Tanche" (Commandant Rallier du Baty), dans la région du Plateau continental européen; la première de ces croisières, en Mai et Juin, a permis de faire d'utiles recherches sur la biologie du thon blanc ou germon, dans la zone comprise entre le littoral français et les Açores.

La seconde de ces croisières, dans le Golfe de Gascogne, a permis la continuation, en Juillet et Août, des études effectuées au cours des précédentes années, particulièrement au point de vue hydrologique.

L'Office des Pêches se réserve de faire, à la fin de l'automne ou au début de l'hiver, une nouvelle croisière qui complètera les précédentes.

De plus, le navire "Pourquoi pas?" (Commandant J. B. Charcot) se rendant en Méditerranée, a exécuté à l'aller et au retour, en Manche et dans le Golfe de Gascogne, différents travaux océanographiques.

Par les soins de M. Ed. le Danois, éditeur du Comité du Plateau continental Atlantique, choisi par le Conseil, le premier rapport concernant les travaux de ce comité a paru en Mai 1923; (rapport Atlantique 1921). Le second rapport, concernant les recherches effectuées en 1922, paraîtra incessamment.

### i. Baltic Committee.

*(For Programme see Procès-Verbaux Vol. XXVIII p. 41.)*

**Denmark.** A report has been prepared regarding the distribution and frequency of eggs of cod, plaice, flounder and dab in the Belts and western Baltic in the spring of 1922.

New investigations as to the distribution and frequency of eggs and larvae of cod and flat-fishes in the Baltic have been carried out in April-June 1923.

Investigations as to the density of the plaice population and the rate of growth of plaice have been carried out (May, June 1923).

Marking experiments with plaice and cod have been undertaken.

Investigations as to the food of plaice and cod in the Baltic have been carried out.

**Finland.**

1921. July. Res. 6. In continuation of the work in summer 1922 in July 1923 current measurements were made in the southern entrance of the Sea of Åland and 12 thalassological stations carried out.

1922. Sept. Res. 4. A cruise of 66 stations in the Bothnic, Gulf of Finland and the Baltic north of 57° N lat. was made in June 1923.

1922. Sept. Res. 5. Continuous observations of salinity, temperature and currents on 11 lightships and of salinity and temperature at 27 coastal points were made in the surface and at different depths.

1922. Sept. Res. 6. Observations of oxygen at depths of 90 and 100 metres are going on off Märket.

1922. Sept. Res. 8. The monthly mean values of the thalassological observations will be sent for publication.

Investigations of the cod according to the paragraphs 4, 5 and 6 in the specified programme have been made on the south-western coast.

**Sweden.** Swedens part of the international research in the Baltic has been fulfilled. The results of the research of the Swedish and the German hydrographers in 1921 and 1922 in the Norwegian Channel, the Skagerak, the Kattegat and the southern Baltic have been published by Dr. Bruno Schulz in Hamburg, those of the Finlandish and Swedish hydrographers in the Åland Sea and the Bothnian

Sea in 1922 are still under redaction. A popular resumé of the new investigations in the Baltic has appeared in a paraphlet entitled "Från den internationella Havsforskningens arbetsfält", by O. Pettersson.

In the years 1922 and 1923 extensive researches, which extended over the whole Baltic (i. e. western part of it), were executed in order to study the distribution, frequency etc. of cod, flounder and common dab in the central and northern part of the Baltic. Spawning cods were caught in deeper waters in the middle Baltic, in the Ålands Sea and in the deeper part of the Bothnian Sea off Örnsköldsvik, and it was found that the size of cods was greater in the Bothnian Sea than in the other parts of the Baltic.

In order to know the migration of cod in the Baltic marking experiments have been executed off the coast of Gotland.

A report has been prepared regarding the distribution, frequency etc. of cod, flounder and dab in the Baltic and will soon be published.

A report has also been prepared regarding plaice and its migration etc. in the southern part of the Baltic.

### k. Eel investigations.

1) Sorting of the material of Eel larvæ brought home by the "Dana"-expedition 1921—22 in the Atlantic. A study of this material has been commenced, but is not yet completed.
2) A study of the immigration of the Eel larvæ into the Mediterranean through the Straits of Gibraltar ("Dana"-material, Oct. 1921).
3) A comparative study of the occurrence of elvers ("glass-eels") in northern and southern Europe during the winter of 1922-23 (material from Denmark, Italy and Egypt).
4) An investigation into the life-history of the Conger ("Thor"-, "Margrethe"-, "Dana"-material from the Atlantic and Mediterranean 1905—1922).

### l. Limnological Section.

*(For Programme see Procès-Verbaux Vol. XXVII p. 42.)*

**Denmark.** Some observations have been made regarding the growth and migrations of the sea-trout.

**Finland.** Investigations of the composition of the year-classes of Coregonus albula in various lakes and of the salmon in the Ule- and Kemi-rivers at the Bothnian and the Kymi-river at the Finnish Bay have been continued.

**Holland.** The investigations on the life-history of young salmon and trout in the brooks of the southern part of Holland (Limburg) including age-determina-

tions and food-supply have been continued. A report on the results of these investigations is in preparation and will be published shortly.

Under supervision of the competent Inspector of Fisheries a series of experiments on the artificial hatching of the Alliceshad (Alosa alosa) have been made.

**Ireland.** Work was continued at the Limnological Laboratory on Lough Derg till 31st March 1923, when the Laboratory was closed for financial reasons. The results are now being prepared for publication.

**Sweden.** The director of the Fishery Board of Sweden, Dr. O. Nordqvist, has published an extensive paper on the fishery in lakes and rivers.

# APPENDIX I and II

# I.

# Memorandum

on

## An International Expedition For Sea Research

by

O. Pettersson and C. F. Drechsel.

The first ten years of the international exploration of the Sea were spent almost exclusively on an investigation of the Baltic, the North Sea, the Norwegian and the Barentz Seas. We started from the assumption that the hydrographic conditions, as well as the fishlife and the plankton of these tributaries of the Atlantic, seemingly so well separated both from each others and from the main basin of the Ocean by narrow channels and submarine thresholds, would remain on the whole stationary, subject only to seasonal influences from the atmosphere.

Experience has lead us to other views. There exists an interchange of waters and of living marine animals and plants between the different parts of the Ocean on a far greater scale than our most experienced oceanographers and biologists considered to be possible twenty years ago, and this interchange of waters is intimately connected with the yield of our fisheries.

It will suffice to recall a few of the most striking facts ascertained by the international research.

The migrations of the eel were found to extend from the Sargasso Sea to the farthest recesses of the fjords, rivers and lakes of Europe.

The life-cycle of the herring, the cod and the mackerel is not confined within the limits assumed by former investigators. Even the flatfishes such as the plaice, to which the International Council has devoted a vast amount of scientific research, cannot be regarded as stationary. Plaice which have grown up in the fjords of the Skagerak have been recaptured on the southern slope of the Doggerbank in the North Sea, bearing the marks of the international research.

The seasonal distribution of plankton-forms of southern as well as of northern origin has been found to change considerably in different years.

# I.

# Mémoire

d'une

## Expédition Internationale pour l'Exploration de la Mer

par

O. Pettersson et C. F. Drechsel.

Les premiers dix ans des explorations internationales de la mer furent pour ainsi dire exclusivement consacrés aux investigations de la Baltique, de la Mer du Nord, de la »Mer Norvégienne« et de la Mer de Barentz. Nous supposions tacitement que les conditions hydrographiques ainsi que la vie des poissons et le plankton de ces tributaires de l'Atlantique, apparemment si bien séparés les uns des autres et des bassins principaux de l'océan par d'étroits chenaux et des seuils soumarins, resteraient essentiellement les mêmes, sujets seulement aux influences saisonnières de l'atmosphère.

L'expérience nous a fait changer d'avis à cet égard. En effet, il s'opère entre les différentes parties de l'océan, sur une échelle beaucoup plus vaste que ne l'auraient supposé possible il y a 20 ans nos océanographes et nos biologistes experts, des échanges d'eaux, de plantes et d'animaux marins vivants, et ces échanges sont en connexion intime avec nos pêches.

Pour s'en rendre compte, il suffira de penser à quelques-uns des faits les plus frappants constatés par les explorations internationales.

Nous avons vu que les migrations de l'anguille s'étendent de la Mer des Sargasses jusqu'aux recoins les plus lointains des fjords, des fleuves et des lacs de l'Europe.

Les mouvements migratoires du hareng, de la morue et du maquereau ne se bornent pas aux limites fixées par les explorateurs antérieurs. Les poissons plats mêmes, tels que la plie qui a été l'objet de recherches internationales particulièrement vastes, ne peuvent pas être considérés comme stationnaires. Des plies originaires des fjords du Skagerak et munis des marques des recherches internationales ont été retrouvées dans la Mer du Nord sur le versant sud du Doggerbank.

On a constaté que la distribution saisonnière des formes de plankton, qu'elles soient d'origine septentrionale ou méridionale, varie beaucoup dans les différentes années.

The outcome of the spawning of the herring, on which depends the yield of one of our most important fisheries for years to come, is highly variable from one year to another.

Great, as these vicissitudes in the fishlife and planktonlife appear in European waters, they are surpassed by the changes observed at the other side of the Atlantic, as may be inferred from the decline of the American mackerel fishery and the catastrophic extinction of enormous shoals of the tilefish in certain years.

Great discoveries always bring before us a number of new problems of higher order which must be solved in order to ensure further progress.

The pending problem in this case concerns the system of currents of the great Oceans. Of special interest are the following questions I and II.

I. Whether the changes we observe in fishlife of our seas correspond with the changes we observe in the current-system of the Ocean.

II. Whether these changes are of periodic nature.

From the study of the first problem we ought to be able to discern whether the wanderings of the migratory fishes are spontaneous, i. e. ruled by such physiological causes as are usually ascribed to instinct, or depend upon physical conditions.

From the study of the second we could hope to learn in a certain degree to forecast the monthly and yearly output of fisheries in order to minimize the risks of the fishing industry and put the existence of our fishermen on a less hazardous footing.

Problems of such worldwide size and importance must be attacked with a certain limitation. Considered in general as a geophysical problem, oceanic circulation will claim the assiduous attention and work of many generations. From the more practical point of view of our Council it seems advisable to concentrate the research in general upon the study of the upper layers of the Sea to a depth not exceeding 1000 m., because the plankton and the fishes which inhabit the coastal banks ("the shelf") of our continent are found in waters of no greater depth. The fauna of the abysmal regions and its life conditions should be reserved for expeditions fitted out specially for zoologic or physical and hydrodynamical purposes.

The method of research should not be dredging but sounding down to a certain depth. At certain representative stations the hydrographic soundings should be extended to the bottom of the Ocean and in regions where important climatic questions come into the foreground — as e. g. in the Indian Ocean — soundings in the atmosphere by means of kites and balloon sondes should be executed simultaneously.

Le résultat du frai du hareng, dont dépendra essentiellement nos pêches des années prochaines, varie considérablement d'une année à l'autre.

Ces vicissitudes, qui surviennent de la vie des poissons et du plankton, considérables dans les eaux européennes, sont pourtant de beaucoup surpassées par celles observées de l'autre côté de l'Atlantique, et qui sont certainement dues à la diminution de la pêche du maquereau en Amérique et à l'apparition périodique catastrophale d'énormes bancs de »tilefish« (lopholatylus chamæleonticeps).

Les grandes découvertes amènent toujours de nouveaux problèmes importants qu'il faut résoudre pour assurer les progrès ultérieurs.

Dans l'espèce le problème pendant s'agit du système des courants des grands océans. Un intérêt tout spécial présentent les deux questions suivantes (I et II):

I. Les vicissitudes observées dans la vie des poissons de nos eaux correspondent-elles à celles observées dans le système des courants de l'océan?
II. Ces vicissitudes sont-elles de nature périodique?

En approfondissant la première de ces questions, nous devrions pouvoir constater si les migrations des poissons sont spontanées, c. à d. réglées par les causes physiologiques attribuées ordinairement à l'instinct, ou si elles dépendent de conditions physiques.

En étudiant la seconde question, il est à espérer que nous pourrions apprendre à pronostiquer les résultats de pêche mensuels et annuels approximatifs, et à réduire ainsi les risques de la pêche et par là les dangers auxquels sont exposés nos pêcheurs.

Pour aborder des problèmes d'une telle importance mondiale il faut en premier lieu se limiter. Considéré comme un problème géophysique, les courants océaniques demandraient l'attention inlassable et le travail de beaucoup de générations. Au point de vue plutôt pratique notre Conseil recommande de concentrer en général les recherches sur l'étude des couches supérieures des océans, jusqu'à une profondeur ne depassant pas 1000 m, étant donné que le plankton et les poissons habitant les bancs côtiers (les versants) de notre continent se rencontrent dans les eaux d'une profondeur peu considérable; l'étude de la faune des régions profondes et des conditions vitales de celle-ci serait réservé aux expéditions équipées tout spécialement dans un but zoologique, physique ou hydrodynamique.

Les recherches ne se feraient pas à l'aide du chalut, mais au moyen de sondages jusqu'à une certaine profondeur. A certaines stations représentatives les sondages hydrographiques s'étendraient jusqu'au fond de l'océan, et dans les régions, où des questions climatiques importantes occuperaient le premier rang — p. ex. dans l'Océan indien — on effectuerait simultanément des sondages de l'atmosphère à l'aide de cerfs-volants et de ballons-sondes.

The outfit of an expedition of this kind should be up to date, exact quantitative methods being employed in the analysis of the waters and their contents of plankton. Special attention ought to be paid to the occurrence of the larval forms of the different species of eels.

Another limitation would be, that exploring work of this kind should not interfere with the programme of the Council fixed at its annual meetings. Neither should this routine work be impaired economically by expenses for researches covering wide oceanic areas practically void of fishlife.

On the other hand, considering the immense advantage in the future of an extension of our knowledge of the great surface currents of the Oceans for navigation, for climatology, and ultimately also for our sea-fishery, no opportunity should be lost and every effort to widen our experience in this respect should be met with sympathy and actively promoted and guided by the International Council for the Study of the Sea.

In 1913 we imagined that an opportunity of this kind would arise. The American Government had invited the European States to be represented at the opening of the Panama Canal by one or two ships belonging to the Navy of each country, which would assemble in Hampton Road thence to proceed to Panama and along the Californian coast to S. Francisco. We judged this to be an excellent opportunity to get a synoptic view of the hydrographic state of the great N. Atlantic area, if hydrographic soundings were taken at representative stations on board these ships from the surface to a depth of 1000 m; and if these soundings were repeated on the return voyage some months afterwards they would throw some light on the rate of flow and the changes in the great current system of the Atlantic. Having received favourable answers from 7 countries we were able to proceed to elaborate the details of the programme. His Highness the late Prince Albert of Monaco with never failing interest for hydrographic research declared himself willing to act as leader and to keep the eastern side of the Atlantic under observation, with his newly built ship the "Hirondelle", while the international flottilla crossed and recrossed the Atlantic.

There was no difficulty about equipping the ships with apparatus for research and entlisting a staff of competent scientists, the international investigation being then in full swing, ten European countries and the U. S. A. co-operating in the exploration of the Sea since 1911. The technique had been brought to such a degree of perfection that a hydrographic serial sounding combined with collection of eggs, fishfry and plankton from 0 m to 1000 m depths ought not under ordinary circumstances to occupy the ship more than a few hours. The cruises were to begin early in the year 1915, and at the beginning of July 1914 His Highness Prince Albert of Monaco had assembled the members of the staff on board the "Hirondelle" then anchored in the harbour of Kiel for a final conference.

Then came the war.

Il faudrait, pour une telle expédition, un équipement »up to date«; ainsi pour l'analyse des eaux et de leur contenu de plankton on procèderait d'après des méthodes quantitatives exactes. On prêterait une attention toute particulière à la présence de larves des différentes espèces d'anguille.

Ces recherches seraient en second lieu limitées par le programme fixé par le Conseil à ses réunions annuelles. Ainsi, le travail routinier ne devait pas souffrir économiquement par des frais occasionnés par des recherches de vastes domaines océaniques pratiquement vides de poissons.

D'autre part, si l'on considère l'immense avantage que présenterait à la navigation, à la climatologie et à nos pêches surtout une extension de nos connaissances des grands courants superficiels des océans, aucune occasion ne devait être perdue, et tout effort en vue d'élargir notre expérience à ce sujet devait être accueilli avec sympathie et secondé par le Conseil International pour l'Exploration de la Mer.

En 1913, nous avons cru qu'une telle occasion se présenterait. Le gouvernement américain avait invité les états européens à se faire représenter à l'ouverture du canal de Panama par un ou deux bâtiments de la marine de chaque pays; ils se réuniraient à Hampton Road, d'où ils partiraient pour le Panama, et, en longeant la côte californienne, pour St. Francisco. En faisant, à bord de ces bâtiments, aux stations les plus représentatives, des sondages hydrographiques de la surface jusqu'à 1000 m de profondeur, nous aurions une excellente occasion d'obtenir un aperçu des conditions hydrographiques des vastes eaux du nord de l'Atlantique, et en les renouvelant au retour quelques mois plus tard, ils auraient pu fournir des éclaircissements sur la direction et les vicissitudes du vaste système des courants de l'Atlantique. Quand nous avions reçu de la part de 7 pays une réponse favorable nous pouvions élaborer les détails du programmes S. A. S. feu le prince Albert de Monaco, avec son intérêt toujours vigilent pour les recherches hydrographiques, se déclara disposé à diriger les opérations, et à se charger, à bord de »l'Hirondelle«, son bâtiment nouvellement construit, des observations du côté oriental de l'Atlantique, pendant que la flottille internationale croiserait et recroiserait l'Atlantique.

Equiper les navires des appareils nécessaires aux recherches et enrôler un nombre suffisant de naturalistes compétents, cela ne présentait aucune difficulté, 10 pays européens et U. S. A. ayant depuis 1911 coopéré aux explorations de la mer. La technique se trouvait perfectionné à un tel degré que, dans des conditions normales, une serie de sondages hydrographiques combinés avec une récolte d'oeufs, d'alevin et de plankton de 0 m jusqu'à 1000 m de profondeur ne demanderait que quelques heures de travail. Les opérations devaient commencer au début de l'année 1915, et au commencement de juillet 1914 S. A. S. le Prince Albert de Monaco avait réuni les membres de l'expédition à une conférence définitive à bord de »l'Hirondelle«, mouillé alors au port de Kiel.

Puis la guerre éclata.

Now — after ten years — an opportunity to start a research of the Oceans on a grand scale again arises to which we wish to call the attention of the International Council assembled in Paris for the first time. "L'Hirondelle", the last ship built for H. H. the Prince of Monaco, fitted up in the most complete and splendid manner for oceanic research, is offered for sale by the direction of the Musée Océanographique at a price not exceeding two million Francs. Provided a favourable result of a survey of the ship it appears to be particularly well adapted to the purpose.

Under the present circumstances one cannot expect to raise a subscription in any country in Europe in order to defray the costs of an expedition with such a ship if confined solely to European waters or to the N. Atlantic. But if we extend the programme to embrace also the Pacific and the Indian Ocean, to be explored in the course of a 4 years expedition, we could have some reason to hope to get the support and assistance of other countries in America, Australia, Africa and Asia, interested in the investigation of the currents of the Oceans and their influence on the fishlife of the Sea and the climate of the different parts of the world where problems of manifold nature and of great importance await solution.

In Europe the main interest will be concentrated upon the study of the extent and capacity of the great Atlantic warm-water current which softens our climate in winter and brings rain to our fields in spring and summer. We know so little about the origin of this flow of waters from the South and its connection with the Gulfstream proper, viz. the great circulation of waters in the tropical part of the N. Atlantic around the Sargasso Sea, that it is only with a certain reserve that we dare to speak of an influence from the Gulfstream upon our fisheries and our climate.

It was this problem which first attracted the attention of Prince Albert and led to his wellknown experiments with floats as indicators of the direction and velocity of the surface currents of the N. Atlantic. Valuable informations can of course be gained from a repetition of these experiments especially when combined with exact analyses of the plankton and the chemical properties of the waters such as alkalinity, H and OH-ions, dissolved gases etc.

At the western side of the Atlantic we have the most interesting fields for hydrographic research which exist on Earth, viz. the Sargasso Sea, the Gulfstream and the limiting zone between the Labrador current and the Gulfstream which must be explored by repeated cross-sections and occasionally by deep-soundings reaching from the surface to the bottom or at least to the under limit of the warm surface water. This investigation should be combined with the work of the American scout ships cruising in the icefilled waters of the Labrador current which therefore can be excluded from the programme of the "Hirondelle".

Aujourd'hui — 10 ans plus tard — l'occasion se présente de nouveau d'effectuer sur une vaste échelle des explorations océaniques, et, comme aujourd'hui, pour la première fois, les membres du Conseil se trouvent réunis à Paris, nous nous permettons d'y attirer l'attention. »L'Hirondelle«, le dernier bâtiment construit à S. A. S. le Prince de Monaco, pourvu d'un équipement des plus complets et des plus coûteux pour les recherches océanographiques, est mis en vente par la direction du Musée Océanographique à un prix ne dépassant pas 2 millions de francs. Si tant est que le résultat d'une inspection de ce bateau fut favorable, il paraît particulièrement bien adapté au but.

Dans les circonstances actuelles on ne pourra certainement pas se procurer en Europe les moyens nécessaires pour fournir aux frais d'une expédition avec ce navire, si l'on se borne aux eaux européennes ou à l'Atlantique septentrional. Mais si l'on élargissait le programme de manière à embrasser l'Océan Pacifique, qui serait examiné par une expédition de quatre ans, on pourrait espérer d'obtenir l'aide et l'appui des pays en Amérique, Australie, Afrique et Asie intéressés dans les recherches des courants océaniques et de leur influences sur la vie des poissons et le climat des différentes parties du monde, où des problèmes de nature bien différente et d'une haute importance attendent leur solution.

En Europe l'intérêt principal est concentré sur l'étendu et la capacité du grand courant chaud de l'Atlantique qui contribue à réchauffer notre climat en hiver et amène la pluie à nos champs au printemps et en été. Nous sommes si peu renseignés sur l'origine de ces courants d'eau méridionaux et leurs rapports avec le Gulf-Stream, c. à d. la vaste circulation des eaux dans la partie tropique du nord de l'Atlantique, autour de la mer des Sargasses, que nous n'osons parler qu'avec réserve de l'influence du Gulf-Stream sur nos pêches et notre climat.

En effet, c'est ce problème qui a attiré le premier l'attention du Prince Albert et l'a décidé à entreprendre ses expériences bien connues avec des bouteilles-témoins servant à indiquer les directions et la vitesse des courants superficiels de l'Atlantique septentrional. Des renseignements précieux pourraient être obtenus par un renouvellement de ces expériences, surtout si l'on y ajoutait des analyses exacts du plankton et des composants de l'eau, tels que la salinité, H et OH-ions, les gaz décomposés etc.

La partie ouest de l'Atlantique offre aux recherches hydrographiques les champs d'activité les plus intéressants du monde, c. à d. la mer des Sargasses, le Gulf-Stream et la zone comprise entre le courant de Labrador et le Gulf-Stream, qu'il faudrait examiner à l'aide de sections croisées réitérées et, par occasion, de sondages de la surface jusqu'au fond ou, au moins, jusqu'au-dessous de la limite de l'eau chaude de la surface. Ces recherches seraient combinées avec les travaux des navires explorateurs américains, en campagne dans les eaux remplies de glace du courant de Labrador, et elles pourraient par conséquent être exclues du programme de »l'Hirondelle«.

In the S. Atlantic we have to study one of the great features of oceanic circulation, viz. the exchange of water between the Atlantic and Indian Oceans, the Agulhas, the Benguela and the Falkland currents, and last not least, the undertow of antarctic water in about 800 m depth, which, according to the observations of recent German expeditions, reaches from the northern limit of the antarctic ice-pack in about 44° S Lat. up to 10° or 12° Lat. North.

The Pacific Ocean presents an immense and hitherto nearly uncultivated field of research for hydrographers. Even if two years be allotted to an investigation of the Pacific (e. g. one year for the eastern and one for the western side), we can only consider this as a reconnoitring exploration, which however might prove to be of fundamental importance for subsequent investigations from the side of the adjoining countries Canada, California, Chili, Japan and the Australian States. A survey of the Indian Ocean promises to be of the greatest importance for the knowledge of the climatic conditions of the adjoining countries all of which depend for their existence on the Monsoon rainfalls, i. e. ultimately on the evaporation from the surface of the Ocean. The moisture is given up from a thin surface layer consisting of water of ordinary salinity in the western, and of diluted seawater in the eastern part of the Ocean heated to a very high temperature by the sunshine in the tropics. Part of this moisture is deposited on the hills of the western and eastern Indian peninsula and the surrounding islands, another part is deviated eastwards and southwards where the humidity condenses upon the antarctic polar icecap while the air, deprived of its aequeous contents, completing its circuit forms a "polar front", consisting of a thin sheet of cold and dry air which with vehement velocity spreads northwards over the ice barrier and the icefilled antarctic sea and, returning to the tropics, becomes again saturated with humidity, part of which gives birth to the Monsoon rains of the Asiatic borderlands and islands. This atmospheric cycle corresponds in a remarkable way with the current system of the Indian Ocean. A hydrographical survey of this Ocean demands a ship fitted out for the sounding of the air by kites and balloons sondes as well as for the investigation of the Sea. Prince Albert has given an illustrious example of a combined research of this kind by his work on board the "Alice III" together with Hergesell in the N. Atlantic. At present the "Hirondelle" is the only ship existing fitted out for a research of this kind.

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It seems evident that an expedition which embraces all oceans and involves a circumnavigation of the Earth will cost several millions. The expenditure can be in some degree approximately calculated from the size of the vessel, its consumption of coal and the number of the crew and the scientific staff on board. When

Dans le sud de l'Atlantique nous examinerions un des plus grands réseaux de circulation océanique, c. à d. l'échange des eaux de l'Atlantique et de l'Océan indien, les courants d'Agulhas, de Benguela et de Falkland, et, last but not least, le courant sous-marin des eaux antarctiques à une profondeur de 800 m environ, s'étendant, selon les observations effectuées récemment par des expéditions allemandes, de la limite nord du pack c. à d. de 44° lat. s. jusqu'à 10° ou 12° lat. n.

L'Océan Pacifique présente aux recherches hydrographiques des superficies immenses et jusqu'ici pour ainsi dire inexplorées; deux ans nous seraient accordés pour l'examen de l'Océan Pacifique (un an pour la partie orientale, un an pour la partie occidentale), nous ne pourrions faire que des explorations préliminaires, qui, pourtant, pourraient devenir d'une importance fondamentale pour les pays limitrophes, le Canada, la Californie, le Chili, le Japon et les états australiens, si plus tard les recherches étaient poursuivies. Une exploration de l'Océan indien serait certainement d'une haute importance pour la connaissance des conditions climatiques des pays environnants, dont la prospérité dépend de la mousson pluvieuse, c. à d. en dernier lieu des vapeurs de la surface de l'océan. L'humidité provient d'une mince couche d'eau de surface, d'une salinité ordinaire dans la partie occidentale de l'océan, mais diluée dans la partie orientale qui est chauffée à une température très élevée par le soleil tropical. Une partie de cette humidité se dépose sur les hauteurs des péninsules indiennes orientale et occidentale et des îles environnantes; une autre partie se perd vers l'est et le sud, où elle se condense sur les pics des glaces polaires de l'Australie, tandis que l'air, privé de son contenu aqueux, achève son circuit en formant un »front polaire«; celui-ci consiste en une mince nappe d'air frais et sec qui se précipite vers le nord en se dispersant sur la barrière glaciaire et la mer antarctique remplie de glaces, et, en retournant vers les tropiques, il est de nouveau saturé d'humidité. C'est une partie de cette humidité qui donne naissance à la mousson pluvieuse des pays limitrophes et des îles asiatiques. Ce cycle atmosphérique correspond d'une manière remarquable au système des courants de l'Océan indien. L'étude hydrographique de cet océan demanderait un bâtiment équipé pour le sondage de l'air à l'aide de cerfs-volants et de ballons-sondes, ainsi que pour l'exploration de la mer. Par son travail avec Hergesell dans le nord de l'Atlantique, à bord de »l'Alice III«, le prince Albert a donné un illustre exemple d'une recherche combinée de ce genre. A l'heure qu'il est, »l'Hirondelle« est le seul navire au monde équipé pour ces recherches.

Il est évident qu'une expédition embrassant tous les océans, y compris une circumnavigation du globe terrestre, coûterait des millions. Les dépenses approximatives pourront, jusqu'à un certain degré, se calculer d'après le déplacement du navire, sa consommation de charbon, l'équipage et l'équipe de savants se trouvant

we base such calculations upon the purchase of the "Hirondelle" and upon the estimates of competent specialists we assume: that the number of the crew and scientists on board will not exceed 44, that the purchase of the ship incl. necessary repairs will cost 2 millions, and that the daily consumption of coal at an average speed of 10 knots will be about 10 tons, we arrive at a probable estimate of the costs for an expedition of 4 years of about 12—14 million Francs.

Great as this expenditure seems to be in relation to the resources of a single country, it appears trifling if all countries interested agreed to contribute financially according to the importance a survey of the adjacent ocean would have for the country in question.

This memorandum has been drawn up for having the question it refers to discussed by the Council. If the Council should find its proposal useful and realisable, the next step would be to ascertain the opinion of the leading scientific societies and individuals in the different countries and finally to apply to the various Governments suggested to participate in order to settle the political and economical side of the enterprise by international agreement.

à bord. Si — en nous basant sur l'achat de "l'Hirondelle" et sur une estimation faite par des experts — nous supposons que le nombre de l'équipage et de l'équipe de savants à bord ne dépassera pas 44, que le prix du bâtiment, y compris les réparations nécessaires, sera de 2 millions et que la consommation journalière de charbon sera de 10 tonnes à une vitesse moyenne de 10 nœuds, les dépenses approximatives d'une expédition de 4 ans seraient probablement d'environ 12 à 14 millions de francs.

Ces dépenses, auxquelles un seul pays subviendrait difficilement, seraient en réalité minimes, si tous les pays intéressés y participaient avec des quotes-parts correspondant à l'importance qu'aurait pour le pays en question les explorations de l'océan limitrophe.

Ce mémoire a été élaboré pour que la question dont il traite puisse être discutée à la réunion du Conseil. Dans le cas où le Conseil trouverait utile et réalisable le projet dont il s'agit, on procéderait ensuite à un échange d'opinions avec les sociétés de science et les savants éminents des différents pays, et enfin, on s'adresserait aux divers gouvernements qu'on jugerait disposés à y participer pour obtenir un arrangement international des questions politique et économique.

# II.

# Proposal

from the Danish Commission of Sea Research: —

## On systematisation of Investigations in the North-western Area.

### I. The Importance of the Area for the Fisheries.

The International Investigations have already been systematised for the North Sea Area, and in regard to certain more southerly portions of the Atlantic Ocean, this has recently been done by the formation of the Committee for the Atlantic Slope. It is otherwise, however, with the North-western Area, which lies north of the British Isles, and includes the fishing grounds of Iceland, the Færoes and Rockall.

In view of the great importance of this area as an international fishing ground, there seems reason to consider what steps can be taken to enable the various data and observations which have been or can be procured to be utilised, by co-operation between the various countries, in the most systematic manner, throwing light upon the fisheries and stocks of fish in the area in question.

With the exception of Portugal and the new Baltic States, subjects of all the countries represented on the Council take part in the fisheries in this area, in most cases with the trawl, so that the fishery is thus of a similar international character to that of the North Sea.

The importance of the fisheries in the North-western Area as compared with those of other areas such as the North Sea and the south-western part of the international area may perhaps best be realised from the English fishery statistics, the English fishery in these areas comprising, as we know, a very essential part of the fishery of all nations.

The following data for comparison may be quoted, based on the English statistics for the year 1922.

The North Sea Area is greater than the North-western Area. In the English statistics, the area of the North Sea is given as 152,473 square miles, and that of Iceland-Færoes as 41,557 square miles. The North Sea Area is thus between

3 and 4 times as large as the area about Iceland and the Færoes, which should be borne in mind when considering the figures given below.

The following quantities of demersal fish were landed in England in 1922 (the figures are thousands of cwt.):

| | |
|---|---|
| From the North Sea | 4158 |
| From Iceland-Færoes | 2058 |

In view of the fact that the North Sea Area is so much larger the figures point to a greater abundance of fish in the Iceland-Færoe Area.

The same appears even more distinctly when we compare the average catches per day's absence or per 100 hours' haul for the English steam trawlers. These figures are given below, both for the North Sea, the North-western Area (Iceland, Færoes, Rockall) and the South-western Area (S. of Ireland, Biscay, Portugal-Morocco).

Cwt. of fish per day's absence (I) and per 100 hours' haul (II).

| | I. | II. |
|---|---|---|
| North Sea Area | 19.1 | 125 |
| North-western Area | | |
| Iceland | 51.8 | 975 |
| Færoes | 34.0 | 645 |
| Rockall | 43.3 | 474 |
| South-western Area | | |
| S. of Ireland | 19.6 | 229 |
| Biscay | 10.0 | 131 |
| Portugal-Morocco | 10.8 | 167 |

The figures show clearly enough the great abundance of demersal fish in the North-western fishing grounds, especially for Iceland.

Hitherto, we have only considered the total yield of demersal fish, as shown by the English statistics. Turning to the figures for the separate species, we get the following table for some of the most important forms. The figures are for thousands of cwt. landed in England in 1922.

| | Cod | Coalfish | Haddock | Ling | Tusk |
|---|---|---|---|---|---|
| North Sea | 843 | 69 | 1857 | 53 | 1 |
| Iceland-Færoes | 1043 | 97 | 452 | 42 | 19 |

| | Plaice | Lemon-Sole | Witch | Halibut | Catfish |
|---|---|---|---|---|---|
| North Sea | 509 | 12 | 5 | 12 | 20 |
| Iceland-Færoes | 90 | 16 | 3 | 103 | 117 |

The table shows that of two species, haddock and plaice, the yield is greater in the North Sea than for Iceland-Færoes. For the other sorts, it is either more or less the same, as with the cod, or greater for Iceland-Færoes, as with the halibut (for the last-mentioned species see below, p. 75).

This for comparison between the North Sea Area and the North-western. Between the North-western and the South-western there is, as regards the fisheries, a very considerable difference. This will be at once apparent, without any detailed tabulation, from the fact that the following fishes are almost or entirely lacking in the Iceland Færoe waters: Sole, Turbot, Brill, Hake — and of pelagic forms: Mackerel Sprat, Pilchard, Anchovy, Tunny; or in other words, that the majority of those fishes which are of greatest importance in the south-western area are not fished for at all in the north-western area.

The foregoing should suffice to show the importance of the North-western Area from the point of view of fishery, as also its complete difference in character as compared with the south-western. It will therefore be natural to consider what has hitherto been accomplished in this area, and what possibilities exist for systematising work and observations here as well.

## II. Work already carried out.

Since the commencement of the International Investigations, the work of investigation in the North-western Area has been undertaken by Denmark, partly in collaboration with the Icelandic Fishery Stipendiate Bj. Sæmundsson.

Work undertaken by the Danish Commission with the "Thor" and other vessels during the years from 1903 to the outbreak of the late war provided the first survey, and gave a sound hydrographical-biological basis for the understanding of fishery conditions in this area. Without going into details, the sum of the results may be stated under the following two heads:

1) Both Iceland and the Færoes have each its own distinct stock of fish, independent of other areas, at any rate, for the demersal species.

2) The importance of hydrographical conditions for the fish and the fisheries is shown with superlative distinctness by the Danish investigations with the "Thor" in Icelandic waters. The coasts washed by Atlantic water, especially the south coast, are in hydrographical respects totally different from those with Arctic water, especially the east coast, and this point is of decisive importance to the fisheries and to the migrations and biology generally of all the important species of fish. It has been found, for instance, that the south and west coasts alone, or practically alone, provide spawning grounds for the majority, while some species,

especially the cod, actually grow up in such great numbers on the east coast that there is perhaps no other place in the world where such great quantities of young adolescent cod have been found as here.

In regard to fishery-biology as well as hydrography, then, the various parts of the Icelandic area are extremely dissimilar. There is, in fact, a greater difference in this respect between South and East Iceland than between South Iceland and the Færoes, or indeed between South Iceland and Ireland.

### III. Systematisation of future Investigation work.

How can we now — most effectively — carry forward the work on the foundation laid by the investigations carried out by Denmark in this area? How can we — with the means at our disposal — best systematise the work?

Among such measures as may here be worth consideration, the following four may be mentioned:

1) Measures for fishery statistics.
2) Analyses of commercial catches.
3) Marking experiments with various species.
4) Investigations comprising scientific fishery experiments and combined biological and hydrographical studies.

As regards the Fishery Statistics, there are various points, both as to the separate species of fish and the geographical division of the area, which call for consideration here. The arrangement in detail would however, have to be made by co-operation between experts from the various countries interested, and we shall therefore merely cite here two examples.

In the first place the fishery statistics of most countries enter the entire yield from the Iceland Area under one head. From what has been shown above (that part of the area is purely Atlantic, the remainder Sub-arctic) it will be seen that this is extremely unsatisfactory as a basis for fishery-biological studies. Negotiations should therefore aim at a systematic subdivision of this area, as far as practical considerations permit.

In the second place in regard to certain important species, the statistics distinguish between various size categories (e.g. "large" "medium" "small"). This, however, does not apply to other species, such as for instance the halibut. Nevertheless, there seems to be special reason for such an arrangement in regard to this fish particularly. The species has its centre of distribution in the north-western area, and apparently, does not breed at all in the North Sea, possibly only on the Atlantic Slope itself in the North-western Area (nothing is known as to its propagation save what has been shown by the "Thor" investigations, where larvæ were found in the Atlantic on the range between Scotland and Iceland). In several respects, the halibut occupies a peculiar position among northern species. Single specimens of

this species, for instance, attain a very considerably larger size and higher value than those of our other fishes. Specimens of 100—150 kg. to the value of £8 or £10 or over are by no means rare. Nevertheless all halibut, large and small, are noted under one head in the present statistics. In any study of the biology of this fish, as also of the stock of halibut generally and its power of resistance to the fishery, we should require to follow the fluctuations in the proportion between numbers of younger and older specimens. It would therefore be desirable for the fishery statistics in the future to classify halibut in at least three size groups, which should be fixed on the basis of existing observations as to growth and age of this fish.

Analyses of commercial Catches from the North-western Area. Measurements and weights (sometimes in conjunction with age determinations) of fish taken from representative samples of the catches have now been begun in Iceland and the Færoes. It would be highly desirable to have similar analyses made in other countries where fish are landed from this area, as for instance with plaice landed from Iceland in British ports. Such analyses, if made, would require to be carried out in the various countries according to a previously determined plan common to all.

As regards Marking Experiments and special Investigations, the following may be stated. At the instigation of the Danish Commission for Investigation of the Sea, marking experiments with cod have been carried out during this present year at the Færoes, and the plan drawn up for the work provides for continuation of the same in 1924 both at the Færoes and Iceland, either during or after the conclusion of the cruise of investigation laid down for these waters.

### IV. Proposal in connection with the Council Meeting of 1923.

The Danish Commission for the Investigation of the Sea proposes, in consideration of the foregoing, that the Council should form a Committee, to be named the North-Western Area Committee, to deal with investigations in the waters surrounding Iceland, the Færoes and Rockall.